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The Magnetite Mines Near Port Henry, N. Y.

By L. O. Kellogg

SYNOPSIS—A review of late developments and the present situation in the properties of Witherbee, Sherman & Co., Inc., the Port Henry Iron Ore Co., and the Cheever Iron Ore Co. Witherbee-Sherman, the leading company, has excellent surface equipment and is still planning improvements. Present production and future life of the companies are great.

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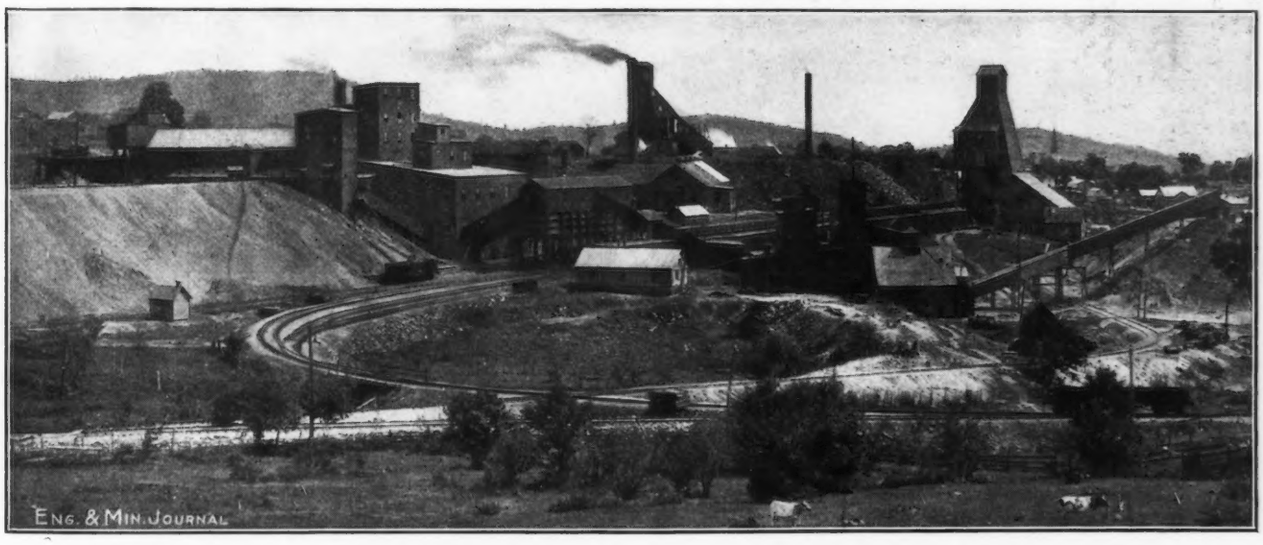
Port Henry is somewhat of a mining center for the eastern Adirondacks. One of the furnaces of the Northern Iron Co. is situated here and three of the operating magnetite mining companies are within a few miles of the town. At Mineville, about six miles west, the Witherbee, Sherman & Co., Inc., and the Port Henry Iron Ore Co., are working, and about two miles north is the property of the Cheever Iron Ore Company.



Joker, Bonanza and Clonan Shaft Houses, Witherbee, Sherman & Co., Mineville, N. Y.

Importance of Witherbee, Sherman & Co.

The Witherbee-Sherman company, in a way, dominates the iron-mining industry of the Adirondacks. Beside the great property at Mineville, it owns many other deposits in the region, and around Arnold Hill especially, it is exploring and developing some extremely large orebodies. It also owns nearly half of the Cheever company, the control of which is held by Bethlehem Steel. The Witherbee-Sherman Mineville property has been often described. An exhaustive account by J. H. Granbery appeared in the Journal, May 12, 1906, *et seq.*; the power plant on Lake Champlain was described by Guy C. Stoltz and Samuel Shapira, in the Journal, Sept. 9 and 16, 1911; the generation and use of the electric power was covered by John Liston in the *General Electric Review*, February, 1912; details of practice are described by Mr. Stoltz in the Journal, Oct. 26, 1912, and at other times. An excellent general conception of the nature of the deposits and the methods of work can be obtained by reading these articles. New developments, on which little has been written, include the two new concentrators, or separators, to use the local term, additional work on the Barton Hill deposits, new developments in the Old Beds, and many projected changes in the hoisting arrangements.

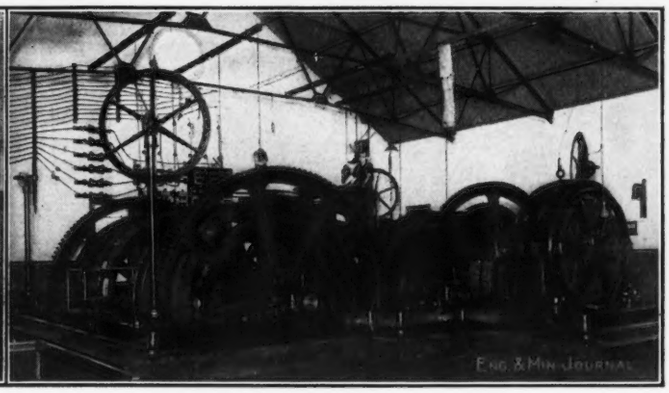
No attempt will be made here to describe the two new separators, Nos. 3 and 4, as it is intended to publish complete descriptions later. The magnetic concentration of iron ore probably reaches about its highest development in these plants. In No. 4, especially, remarkably good work is done. This mill handles all of the Barton Hill ore, and nothing else and the grade of this material is low at present, a little better than 30%, so that the ratio of concentration is often $2\frac{1}{3}$: 1.

Generation of Power

Electric power is extensively used both on the surface

and underground in all the mines. Much of this energy is converted to the compressed-air form and used thus. Practically no steam is used direct, although most of the electric power is steam generated. The latest and best of the steam-power plants is that at Port Henry, on the lake shore, where a 6600-volt current is generated by one 800-kw. and one 1500-kw. vertical Curtis-General Electric turbo-generator. This plant is modern, efficient and excellently designed and constructed. Coal is unloaded direct from the Delaware & Hudson cars and the long pull up the hill to Mineville is saved. Furthermore, Lake Champlain furnishes an inexhaustible supply of cool condensing water, the lack of which has seriously interfered at times with operations in the Mineville steam plant. This latter plant, although older, is above the average of mine power plants. It consisted originally of a 750-kw. generator driven by a corliss engine. This engine is now run noncondensing, and the exhaust steam used in a 750-kw. horizontal mixed-pressure turbo-generator. The boiler plant was increased only 53%, to obtain this increased power capacity of 100%. To avoid enlarging the power house, the turbo-generator was installed above the condensing apparatus, being supported on six reinforced-concrete columns, one foot square. The possibility of running on a foundation of this nature, illustrates strikingly one of the differences between turbines and reciprocating engines.

TURBO-GENERATOR, MINEVILLE



FOUR-DRUM HOIST, HARMONY MINE

In addition to the steam-generated electricity, a considerable amount of power is purchased from a hydro-electric company, its entire output being taken. This company has two plants, one rated at 375 kw. on the Black River, at Kingdom, and one of 300-kw. on the Bouquet River, at Wadhams Mills. Current from these various sources is brought to Mineville, transformed and distributed as required. A certain amount of power is also sold to the Cheever Iron Ore Co., which taps the transmission line from the Port Henry station.

LARGE COMPRESSOR PLANT

The compressor installation is rather elaborate. Five of the machines are in a building between "A" and "B" Harmony shafts, which also shelters the hoist serving these shafts. Of these compressors, one, the latest, is a large Nordberg constant-capacity machine with all valves of the corliss type, direct-connected to a 400-hp. synchronous motor. Two other compressors of 2500 cu.ft. capacity, one Nordberg and one Ingersoll-Rand, are belt driven by 400-hp. synchronous motors. Two smaller Ingersoll-Rand machines of 1250 cu.ft. capacity are belt-driven by 200-hp. induction motors. Another similar Ingersoll-Rand machine at the Joker power house feeds into the compressed-air system.

The compressor installation was designed with a good deal of care. A great part of the Mineville load consists of induction motors, as in the mills and on the hoists. These motors, with the fluctuating nature of their work, had a serious effect on the power factor which was as low as 65%. It was, therefore, decided to drive the large compressors by synchronous motors, which, with their leading current, compensate for the lag of the induction motors and raise the power factor to 90%.

ELECTRIC HOISTS

Electric hoists are used exclusively, and four new ones of 300 hp. have been ordered from the Nordberg company for use in various places on the surface and underground. This is of rather unusual interest, as the Nordberg hoists and compressors heretofore have been chiefly noted for their elaborate valve design and high efficiencies. The Nordberg company furnishing electric hoists is rather a significant indication of the trend of modern hoisting practice.

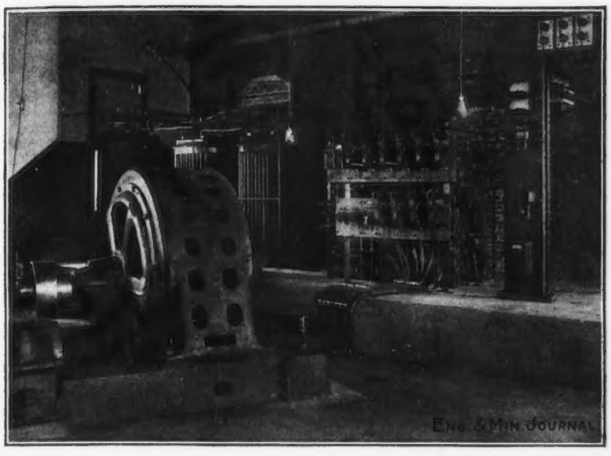
CONCRETE CONSTRUCTION

Concrete is the favorite building material, both block and monolithic construction being used, as the case warrants. The new separators, the office building, the Port Henry power house and numerous houses and tenements are examples of its use. The tenements, so called, are large houses to be used as licensed boarding and rooming houses for the men. They are unusually good looking and well built. The tailing from the separators is ideal material, both for sand and aggregate, a product up to 2 in. in diameter, being made on the cobbing machines.

UNDERGROUND WORK

The underground work of the Witherbee-Sherman company has been described in the articles previously mentioned. The methods of mining depend largely on the nature of the orebodies, which are alike only in being usually inclined at a low angle. In the upper of the "Old Beds," now mined out, a back stoping method was in use. The system now followed in most of the mines is a bench or underhand stoping method. Two-man piston drills are used, mounted on tripods. The introduction of one-man Leyner machines is contemplated. At the

Barton Hill mine, the ore bed has a fairly uniform hanging wall, but a foot wall that rolls both parallel to the dip and parallel to the strike. This makes an exceedingly difficult situation to meet. The ore is handled on inclines to the tunnel level. From the incline, levels are led off at about 50-ft. intervals; a certain amount of ore is left on the foot wall to form a bluff or bank at the in-

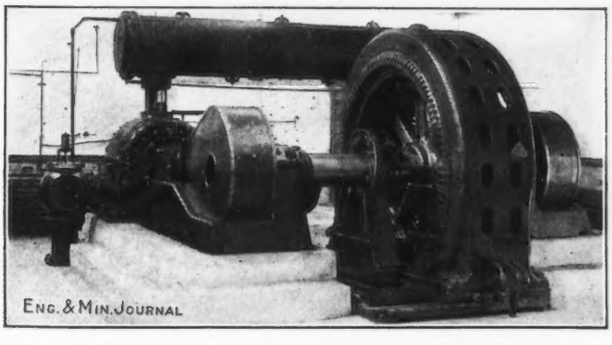


ELECTRIC HOIST CONTROL

cline, so as to facilitate dumping into the skips; away from the incline the ore is mined clean except for pillars left to support the roof. The "level" is not a drift so much as a stope in which the top is kept in advance of the bottom so as to form benches. A track from the loading station in the incline is kept up to the face.

TASK AND BONUS SYSTEMS

The mucking is done under a task system, 12 cars being considered a shift's work for a man; this amounts to 18



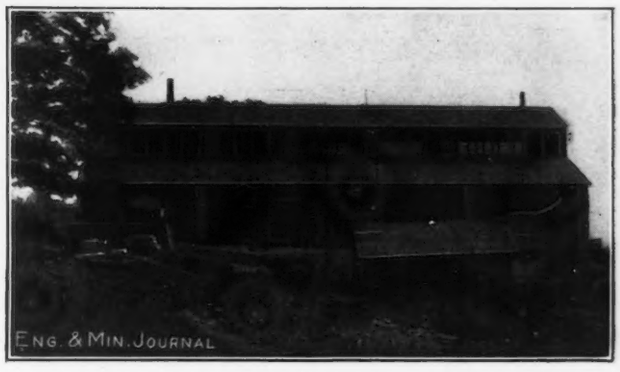
400-HP. INDUCTION MOTOR AND COMPRESSOR

tons, more or less, depending on the grade of the ore. The length of tram is short and the cars are low; the bottom, however, makes shoveling difficult. It is intended to introduce a bonus system before long for both mucking and drilling under which an additional payment will be made for each car, or each foot of hole over a fixed minimum. In order to obtain sufficient data to grade the payments intelligently, the company has introduced a prize system; first, second and third prizes of $5, $3 and $1, respectively, are offered to the machinemen for the highest average footage drilled in each mine. About the best shift's work so far has been a little over 40 feet.

DEVELOPMENTS AND PLANS AT OLD BEDS

The Old Beds are mined at present through the Joker and the Bonanza shafts. The upper of these beds consists of a long flat-dipping pod with cross-sectional dimensions approximately equal, overlying the relatively thin lower bed. It was at one time supposed that these "upper" and "lower" beds were one[1], the result of folding in the gneiss. Later exploration and mining revealed the fact that they are distinct beds. The property line between the Witherbee-Sherman and the Port Henry companies crosses diagonally through the upper portion of the beds. The Port Henry company is mining the upper portion which it owns, and the activities of Witherbee-Sherman are confined to the bottom portions where the lower Old Bed is being mined and preparations made to extract some new deposits disclosed by drill holes. The exact relation of these new deposits, which are two or three in number, is not known; they may be extensions or faulted portions of either one of the Old Beds or may be distinct deposits.

The Bonanza shaft is vertical until it strikes the ore of the upper bed. Here it turns and follows the ore for some distance down the dip. It then turns to the vertical again and descends to the lower bed. The Bonanza shaft



CHEEVER COMPRESSOR HOUSE AND SUBSTATION

will soon be practically abandoned. The Joker shaft is inclined at 78° for 1000 ft., to the lower bed. It is equipped with the best hoist in the camp, of Wellman-Seaver-Morgan make, with two 10-ft. drums, each clutched to the shaft, and with compressed-air brakes; it is driven by a 500-hp. General Electric motor. The control of the hoist is had through a contactor, providing for seven-point acceleration and equipped with current limit and overload relays. The Joker will continue to be the main hoisting shaft for the Old Beds. Hoisting will be conducted on the stage system. Three of the new Nordberg hoists will be installed underground to operate on three slopes or inclines, by means of which the remaining ore in the lower bed will be extracted and the new discoveries explored and mined. The skips on these slopes will dump into pockets either at the Joker shaft itself or connected with it by crosscuts in which electric tramming will be installed.

The Harmony ore is hoisted through two shafts "A" and "B" by means of a four-drum hoist in the same power house with the compressors, the hoisting ropes running over turn sheaves. The present management is not responsible for this hoist and intends to change it soon. It is, therefore, permissible to say that it is about as bad as one often sees and it is to be hoped it is unique. A 300-hp. induction motor is geared to drive a shaft to

[1]J. H. Granbery, "Eng. and Min. Journ.," May 12, 1906.

which are permanently geared two parallel shafts, a double reduction being thus effected. Clutched to each of the parallel shafts are two drums, one pair for "A" mine shaft and one for "B." When the motor runs, as it does most of the time, the drum shafts revolve and always at the same speed as regards each other. The motion of the drums themselves depends on their being clutched in, and from one to four drums may be moving at one time. If more than one drum is hoisting at the same time, they must move at the same speed. No attempt is made to hoist in balance, in fact the ropes are not arranged to permit this. Lowering is done with the drum unclutched and must be done under the brake alone. Three engineers on a platform in the middle of the hoist manipulate the motor control, the brakes and the clutches. With four drums moving, their work looks to the bystander somewhat exciting. The hoist has all the attributes of a man-killer. It is stated, however, that its use has been entirely free of accidents. This is the fault of Witherbee, Sherman & Co., Inc., not of the hoist.

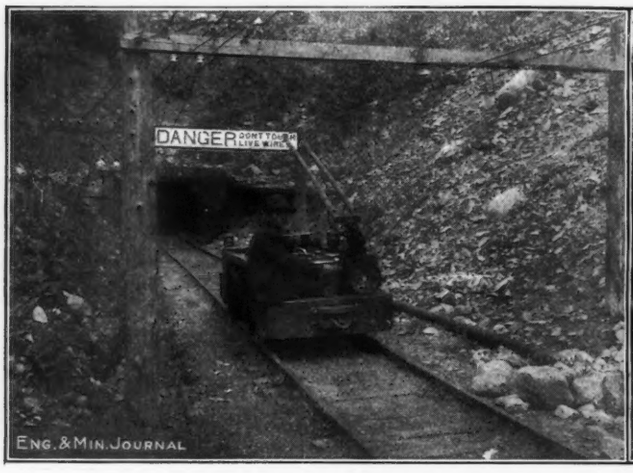
Changes in "A" Shaft

A new hoisting system is planned for "A" shaft, which will entail cutting off the two "A" drums from operation and the use of the hoist for "B" shaft only. Both "A" and "B" shafts are vertical for about 300 ft., where they turn and follow the ore as inclines. Beginning with the incline portion, the two tracks of "A" shaft split and diverge, one going on one side of a dike, one on the other. These split tracks are not only irregular in dip, as they follow the foot wall, but also meander considerably laterally, giving a corkscrew resultant. They are a constant source of accident and delay from derailed skips. It is planned to straighten and double track the inclined portion on the west side of the dike, hoist with two drums not in balance, however, dump to a 100-ton bin and deepen the vertical portion of the shaft so as to load from this bin. This rearrangement will necessitate the use of the fourth of the new Nordberg hoists mentioned. Only one 5-ton skip will be operated in the vertical portion of the shaft, the other drum of the surface hoist being used for a man cage. The inclined track east of the dike will be used for handling men with a single-drum hoist. The incline portion of "B" shaft does not split and no changes are contemplated there.

Barton Hill Development

At Barton Hill there is one main adit through which the ore is trammed to the bins of No. 4 separator. A good many old workings existed in this deposit chiefly above the tunnel level. A great deal of ore remains, however, above the tunnel level and its existence has been proved for 2000 ft. below the level measured on the dip. Two inclines below the tunnel and two inclines or raises above will deliver ore to wooden bins on the level where the electrically drawn ore cars will be filled. The inclines below are known as the South Pit and Intermediate; those above, the Orchard Vein and the North Pit. The work above the level involves considerable straightening and rearrangement of tracks.

At present the company is mining a little less than 3000 tons per day. This is not up to mill capacity, as neither No. 3 nor the old plants are run both night and day, and also a large amount of Port Henry company ore is handled at one of the old plants. Of this amount, about 1000 tons of 30 to 35% ore comes from the Barton Hill tunnel, about 900 tons of 45 to 48% ore from the "A" and "B" Harmony shafts and about 1000 tons of 55% ore from the Old Beds through the Joker and Bonanza shafts. To this must be added about 50 tons of 40% ore from the Smith mine. Practically all of this ore is concentrated, although at the Joker shaft some lump waste is sorted out.



Electric Haulage in New York Iron Mines

Witherbee, Sherman & Co. Cheever Iron Ore Co.

But for strike troubles, this would have been a banner year for Witherbee-Sherman. As it is, the production for the last six months of the year will be not far from 500,000 tons. Of this year's shipments, a large part has been to Nova Scotia by water, the route being through Lake Champlain and the St. Lawrence, involving a transfer to ships.

Costs

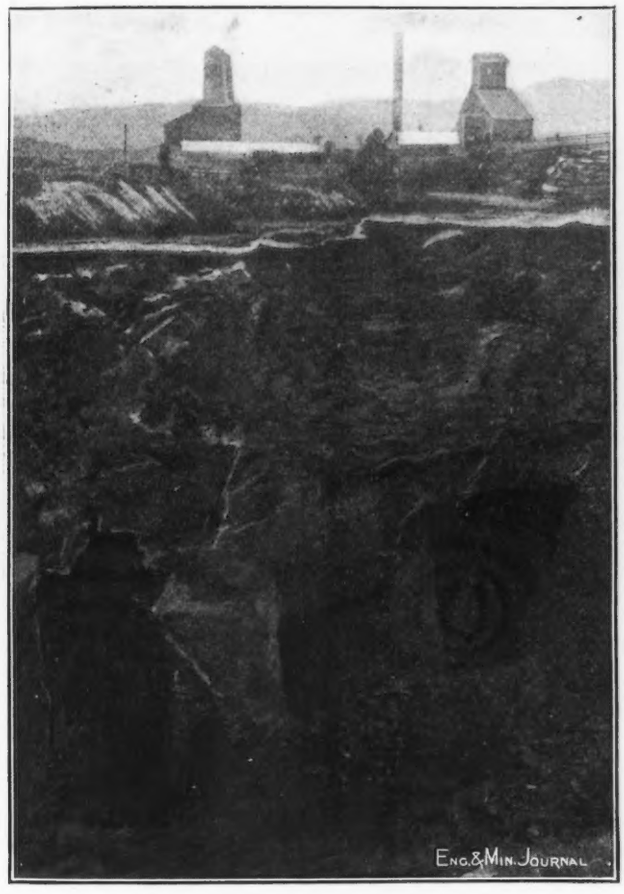
A simple, but detailed cost-keeping system is in use, the power consumption receiving special attention. Power-generating costs for a typical month ran as follows: At Port Henry plant, 0.85c. per kw.-hr.; at Mineville plant, 0.927c.; power purchased, 0.6121c.; average, 0.806c. The kilowatt-hour consumption for this month was 1,148,300 and during the month 63,551 tons of ore were mined and 59,639 tons of concentrate shipped. This rather close correspondence is due to the fact that the Port Henry

ore milled almost compensated for the tailing discarded.

The number of man-shifts per day will run from 1100 to 1150, of which 800 to 850 are underground. The tonnage broken per underground man is about 5½ at the Harmony and the Old Beds, and 4½ at Barton Hill. The lower figure in the latter case is due to the fact that the ore there is lower grade and so lighter, and also to the fact that work in this mine is more recent and the highest efficiency has not been obtained.

The Port Henry Iron Ore Co.

Next neighbor to the Witherbee-Sherman company is the Port Henry Iron Ore Co., working the upper part of the Old Beds, as stated before. The operations of this company are about equivalent in extent to any one of the three Witherbee-Sherman mines, with a production of about 800 tons per day. There are thus four mines in the camp, all within a circle of about one mile in diameter, which can produce about 1000 tons a day each and with a probable future production covering a good many years. The importance of Mineville is thus indicated.



Old Openings, Port Henry Openpit
Joker and Bonanza shafts in distance.

The Port Henry production is of high grade; about half of the hoisted material is shipped as crude lump ore, the rest is treated by Witherbee-Sherman. Some hand sorting is practiced for the purpose of eliminating lump waste.

The plant of the Port Henry company, while rather complete at one time, is not uptodate except at the Clonan shaft. Hoisting at present is carried on through the 21 and Clonan shafts. The 21 shaft is a daylight shaft in a way, the upper part for several hundred feet lying on the foot wall of the great openpit. The Clonan shaft is vertical. Descriptions of the sinking and equipment of this shaft by Guy C. Stoltz can be found in the Journal, Jan. 11, 1908, and July 23, 1910. The headframe is a substantial steel structure, the hoist is a Sullivan double-drum corliss and compressed air is furnished by two Sullivan corliss, tandem-compound, two-stage, steam-actuated machines. The Port Henry also plans some improvements for the future. A 750-kw. turbo-generator will be installed to furnish power for underground electric pumping, and for electric hoists at some of the slopes in the old openpit.

Port Henry Co.'s Openpit

The Cheever Company

The Cheever Iron Ore Co. has been for several years successfully operating an old magnetite property, situated near the lake and a few miles north of Port Henry. A full account of the property by Guy C. Stoltz was published in the Journal, Oct. 21, 1911. Peculiarly difficult mining problems are here encountered. The ore outcrops at an angle of about 45°, but flattens rapidly at a

comparatively shallow depth and remains approximtely horizontal. The bottom of the flat deposit is a miniature, buried mountain range, the foot wall rolling in both directions. As a consequence, while the ore is hoisted through two shafts, using a single drum for each shaft, there are 14 drums in use underground, consisting of 10 air-actuated single-drum hoists, one double-drum electric, and two single-drum electric. The air engines especially are small and light to facilitate moving about and resetting as workings are advanced and new ridges and valleys have to be traversed. The underground handling system has been most cleverly worked out.

Hoisting

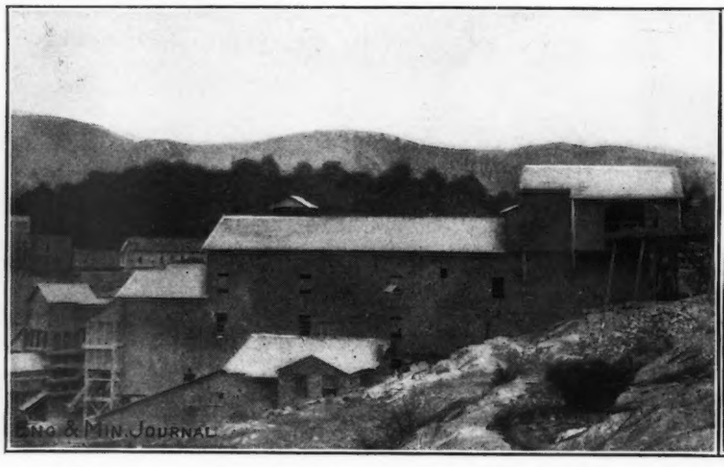
There are three shafts equipped with headframes and houses, the Witherbee, the Tunnel and the Weldon, but of these, only the Weldon, at the southerly end of the outcrop, and the Witherbee, on the northerly part, are operated. A small power house set back of the Weldon, covers a two-drum electric hoist, one drum serving the Weldon and one the Witherbee. Each of the ropes has to be taken around two turn sheaves and the Witherbee rope is also conducted over a series of pulley stands. There is a pinch in the formation, making a barren zone between the Weldon and the Witherbee workings. When the property was reopened, mining tributary to the Weldon shaft soon exhausted that lens and it was found necessary to open up the Witherbee lens in a hurry. At present, all mining is conducted in the Witherbee lens. The four underground hoists collect the mined ore eventually into a skip pocket at the Witherbee shaft. From this pocket some of the ore is hoisted to the Witherbee ore bin and some electrically trammed in 8-ton trains to the Weldon shaft, and thence hoisted. The electric locomotive uses all three phases of the alternating current with two trolleys.

Surface Equipment

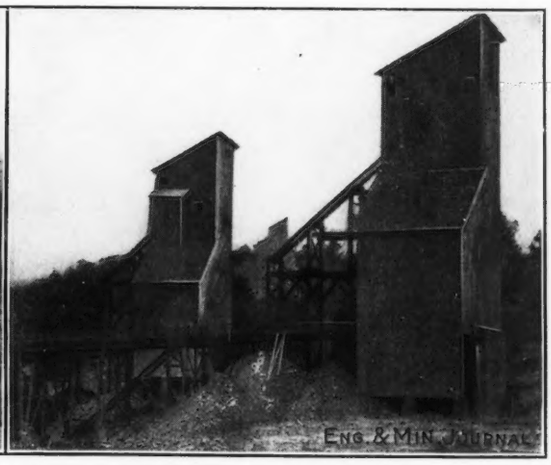
The ore from the Weldon surface bin is trammed on a trestle to the near-by separator by a Hunt automatic railway, which often works satisfactorily. The ore from the Witherbee also is lowered on a trestle, but with an electric hoist. The hoisted skip in the Witherbee headframe is handled over a turntable, which dumps it into either the ore or the waste bin.

The separator uses Ball-Norton magnetic machines, as is general throughout this region. Some changes in its design increased its capacity to 500 tons per day. To supply this tonnage, the mine is worked only on day shift. The concentrate from the mill is lowered to a bin built beside the Delaware & Hudson tracks on the lake shore. Lowering was formerly done in stages with gravity planes. An electric hoist has now been installed and the tramway rebuilt on a single track. Accumulated tailing was used for filling and one cut was made so that the grade is more nearly uniform, the handling of the concentrate thus is cheaper, much labor being eliminated. The length of the tramway is about a half mile and the drop about 400 ft. Electric power furnished by the Witherbee-Sherman Port Henry station is used exclusively, part of the supply being converted to compressed air in the substation shown. Two compressors are used, one Ingersoll-Rand belt driven by a synchronous motor and one Chicago Pneumatic Tool Co. direct-connected to an induction motor.

For the information presented here, acknowledgment is especially made to H. Comstock, of the Witherbee-Sherman company, J. R. Sullivan, of the Port Henry company and Arthur E. Hodgkins, of the Cheever company.



Cheever Separator, Loading Bin at Lower Left



Weldon, Witherbee, and Tunnel Shafts

Metallic Beryllium

Two German investigators recently made some experiments on the reduction of metallic beryllium (*Elec. Rev.*, Oct. 18, 1913). The metal was obtained by the electrolysis of a fused mixture of the pure fluorides of beryllium and sodium. The product was purified from adherent oxides by centrifuging the fine powder in a mixture of ethylene bromide and alcohol. It was then compressed into cylinders and fused. The metal, after melting, had a specific gravity of 1.842, melted at 1280° C., and did not volatilize at 1900°. It does not tarnish readily, and the authors say that its apparent inertness is, like that of aluminum, due to a film of oxide. It will be noticed that beryllium is much lighter than aluminum.

For Refractory Lining of Fireboxes, the only satisfactory materials available for use on a large scale, are fireclay brick, silica brick and bauxite brick. Both magnesia and chromite brick spall too freely when subjected to a cold draft ("Proc. Engineers Soc. of West. Penn.," July, 1913). Because the former is highly basic, and the latter neutral, they have been tried along the clinker line, and while they were successful in reducing the adherence of slag, they were not sufficiently durable to be economical.

The Byron Oil Field of Wyoming

By A. P. Rogers*

A rather interesting but small oil field occurs in northern Wyoming close to the Montana line. It is interesting principally on account of the high grade of the oil, which has a paraffin base and contains nearly 30% of gasoline and 40% of kerosene. It is known as the Byron oil field, and is situated upon the Garland anticline, seven miles west of Cowley, Wyo., and a similar distance east of Garland, upon the Cody branch of the Chicago, Burlington & Quincy Railroad.

The rocks of this section of Wyoming, and extending into southern Montana, belong to the Cretaceous period. Through the Bighorn Basin, east of the National Park, the country has been folded into a series of small anticlines on the western slope of the large anticline of the Bighorn Mountains. It is in these isolated minor folds that the oil and gas deposits have been found. The Garland anticline extends from Polecat Creek southeasterly to the Shoshone River, a distance of about seven miles, having the form of a slightly elongated dome, with an elliptical plan, the major axis of which extends in a northwest-southeast direction. The sides and ends are gently inclined.

The crest of this anticline is in the black carbonaceous shales near the base of the Colorado formation. Capping these shales, the heavy sandstones appear, but over the area where drilling operations have been conducted, they have disappeared. Directly across the southern end of the anticline, the Shoshone River has cut a wide path, leaving a bluff 75 ft. high on the northern side of the river.

Two companies are now operating in this field, and they control practically all the desirable ground. About 30 wells have been drilled, but many of them were so poorly done with unsuitable rigs that they are of little value as a guide to the exact limits of the productive area. Few exact records have been kept of the holes drilled, so that the underground conditions can be judged only from the accounts of those who happened to be present at the time the work was done. Most of the drilling has been confined to the low river-bottom land on the southern end of the anticline. Several thin sands were penetrated until a depth of 600 ft. was reached, where sand 40 ft. in thickness was encountered, containing commercial quantities of oil under sufficient gas pressure to force it to the surface without pumps. From one well during the past year an output has been maintained which supplies the refinery at Cowley with 165 bbl. per day, the capacity of that plant.

The area from which a steady output of oil has been obtained is limited, but about one-half to three-quarters of a mile to the north of these wells and upon the higher ground, two gas wells were sunk, 1670 and 1675 ft. deep, respectively, close to the crest of the anticline. They passed through a sand at 1200 ft. from which a small amount of oil was obtained, and then one of them ran into a heavily charged gas sand at 1675 ft., which blew the tools out of the wells. A 10-in. casing was used at the surface, and the gas is said to be under a 655-lb. pressure; but now it has been capped and the gas is used only for illuminating and heating purposes in the neighborhood. The sand from which this gas comes is probably the Cloverly formation. Whether it contains much oil has not been determined, but the indications are not favorable. Five wells upon a 40-acre tract of land in the river-bottom have encountered oil in the 600-ft. sand. One of them has been shot and produces all the oil now being disposed of. The other four wells are capped and have become clogged with paraffin.

The oil has a paraffin base and a gravity of 42 on the Baumé scale. It is pumped seven miles to a small refinery on the railroad at Cowley. The refined gasoline, having a gravity of nearly 60, and the kerosene are sold to the Continental Oil Co. for distribution. The refinery owners plan to increase their capacity in anticipation of an increased yield from the oil wells as soon as they have been cleaned out and put in proper condition.

*Mining engineer, 60 Broadway, New York.

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The Lake Superior Iron-Ore Outlook for 1914

Special Correspondence

The figures of this season's ore movement from the Lake Superior iron regions, showing a tonnage considerably in excess of that shipped at the corresponding date last year, indicates that it is not a question of the shipments of 1913 reaching 50,000,000 tons, but by how much that vast production will be exceeded. On the Marquette range, big inroads have been made in most of the stockpiles and there is now ample room to store the ore that will be hoisted during the winter. In particular, the Cleveland-Cliffs Iron Co. had been shipping heavily late in August and early in September from the Cliffs Shafts mine at Ishpeming.

The railroad companies are prepared to move an immense tonnage, one even materially surpassing that now being moved. There are bigger and better docks on the Lake now than ever before and the number of cars and locomotives especially provided for the ore traffic has never been greater. Heavier trains are being hauled. While there are exceptions, the mines in general are employing large forces. On the older ranges, many first-class miners thrown out of work on account of the strike in the Michigan copper country, have been given places. There is practically not an idle man in the region.

Increase in Railway Facilities in 1914

With its extension from Crystal Falls in commission in 1914, the Chicago, Milwaukee & St. Paul will become an important factor in the transportation of ore from the Iron River district of the Menominee range next season. The grading has been completed and the work of laying the rails will soon be finished. The assembling yards will be one mile east of the village of Stambaugh. There will be 16 tracks, each one-half mile long. The yards will be capable of holding 600 cars. Adjacent to the tracks will be an eight-stall roundhouse, water-tank, coal-sheds and other buildings. The district has waited many years for the coming of a second railroad and the arrival of the first train will be appropriately celebrated. The Chicago & Northwestern heretofore has been the only line extending to the field.

The McGreevy Steel Co., of Duluth, is preparing to open up the Sheridan mine, which is within the Iron River village limits. This property is already well de-

veloped and needs only a good plant of machinery to put it on the shipping list soon after it is unwatered. The machinery has been ordered. The McGreevy company is operating several properties in the district. A new plant of machinery will be installed this month at the Purcell tract, in Section 14, 43-36, adoining the Forbes mine of the Jones & Laughlin company. The plant will consist of two 150-hp. boilers, a 10-machine air-compressor, already on the ground, and a hoist. Shipping from this property has been in progress for several months. The ore is coming from the 220-ft. level.

Mesabi Shipments to Date

Since the first find was made on the Mesabi along about 1890, that biggest of all the Lake Superior ranges has shipped more than 300,000,000 tons of ore. Since that year approximately 210,000,000 cu.yd. of stripping have been removed and 140,000,000 cu.yd. of ore has been taken out. The deepest mine on the range is the Leonidas property of the U. S. Steel Corporation's Adams-Spruce group at Eveleth. The Leonidas also is known as the "model mine" of the Mesabi. It is an extension of the Adams westward. The shaft is 460 ft. deep, a shallow depth compared with the 2500 ft. reached on the Gogebic and the 2100 ft. attained on the Marquette range, but these great Mesabi orebodies are horizontal, instead of standing on edge, and they have great lateral proportions. The timbering of the stations, main-drifts and crosscuts at the Leonidas consists of steel I-beams. The lagging is of slabs of concrete, and the roof is of reinforced concrete. The pumping station at the bottom of the shaft is a mammoth affair, lined with steel and concrete.

The deepest openpit on the Mesabi is at the Steel Corporation's Norman property at Virginia. It is 350 ft. deep, and all shovel work in it has been abandoned. The Genoa, another of the Steel Corporation's big pits, is getting too deep for shovel mining and most of the ore is now being milled. The biggest mine on the range, as well as the largest iron property in the world, is the Steel Corporation's Hull-Rust pit at Hibbing. The pit is several miles in length, and wide in proportion, and there are many million tons of ore still to be taken from it. The wettest ore mined on the Mesabi is that procured at the Brunt property of M. A. Hanna & Co. The Brunt ore carries 18% moisture, which is reduced to 6% by four driers. Two of the driers can dry 40 tons each per hour and the other two can dry 20 tons each per hour, a total capacity of 120 tons per hour.

The Soo Line, which is extending its Cuyuna system to the town of Manganese and the Iron Mountain mine, expected to finish the grading of that stretch of road late in September or early in October. The rails will be laid at once. Much activity in that region is looked for when train service is established. At the Iron Mountain mine, a crew of 25 men is sinking a three-compartment shaft. The deposit lies at a depth of less than one hundred feet. The ore is said to be manganese of high grade. It is expected the mine will ship this autumn. The Duluth-Brainerd Mining Co. is sinking a shaft in Section 32, 47-29. John T. Jones and associates are sinking a shaft on the Harker-Hammel property, a short distance northeast of Manganese. The Cuyuna-Mille Lacs and Cuyuna-Duluth mines have increased forces and are increasing production. At the Adams property at Oreland drifting is now in progress and it is expected that shipments will begin soon.

Heavy Industrial Locomotive

A heavy industrial locomotive has been built for use on the 36-in. gage industrial railway system at the steel works of the Tennessee Coal, Iron & Railroad Co., at Ensley, Ala., says *Engineering News*. It is a tank engine of the 0:6:0 class, with large tanks alongside the boiler and with a coal bunker on one side of the cab so that the cab is open at the rear. The wheels are placed close together, with a wheelbase of only 9 ft. to enable the engine to operate on sharp curves. The connecting-rods drive the rear axle, and the Walschaerts valve-gear is used to operate the slide valves. A steam brake is applied to all the wheels. The locomotive was designed for heavy and severe service, and is believed by the builders to have the heaviest load per square foot of track for an engine of this class, with its short wheelbase. The engine was built by the H. K. Porter Co., of Pittsburgh, Penn., and its leading dimensions are as follows:

Type of engine	0:6:0 (tank)
Gage of track	3 ft. 0 in.
Service	Yard work at steel plant
Wheels (6) diameter	3 ft. 10 in.
Wheelbase	9 ft. 0 in.
Weight in working order	147,000 lb.
Weight per sq.ft. of track	5,445 lb.
Cylinders	19x24 in.
Boiler pressure	200 lb.
Length over bumpers	27 ft. 8 in.
Width over all	8 ft. 10 in.
Height, rail to top of smokestack	13 ft. 0 in.
Water in tanks	2000 gal.
Coal in bunker	1200 lb.
Tractive force	32,000 lb.

The reason for using such a heavy locomotive for the yard work at Ensley was that two of the smaller engines (97,000 lb. on driving wheels) were required to handle a heat from the openhearth furnaces to the mills, and at times this was accomplished with difficulty and attended by more or less delay. The new engine handles these loads without any difficulty and has reduced the repairs to the equipment to a minimum. The sharpest curves are of 96 ft. radius, and the maximum grade is 1%. The engine will haul 615 tons gross, or 26 loaded mold cars, with 1500-lb. drawhead pull, developing 39,000 lb. tractive power on level track.

Nickel Brasses

A brass containing a certain percentage of nickel in addition to copper and zinc is similar in mechanical properties to an ordinary brass of higher copper content than would be the case if the nickel were replaced by another metal, according to L. Guillet, *Rev. Met.*, p. 1130, 1913. Other things being equal, the addition of a small percentage of nickel makes a brass easier to work cold. An improvement in the mechanical properties of brasses is effected by the presence of up to 10% of nickel.

Mine Rescue Car Itinerary

IRONWOOD CAR NO. 6

Arrive	Leave	Station
Nov. 10	Nov. 15	Ely, Minn.
Nov. 17	Nov. 22	Aurora, Minn.
Nov. 24	Dec. 6	Gilbert, Minn.
Dec. 8	Dec. 20	Eveleth, Minn.

Lead, Zinc and Copper Smelting in America

SYNOPSIS—A record of observations on current American metallurgical practice, and of comparison of American methods with European.

Conditions, both general and in regard to mining and metallurgy, differ so radically in the two hemispheres that not only the evolution of metallurgy itself, but also the requirements which are made on the other side in solving certain problems, are unlike our own practice. The metallurgical industry of America is hardly 50 years old and is only in the beginning of its evolution as compared with European mining and metallurgy. In the Eastern United States, general conditions, such as the density of population and the wage conditions connected therewith, the existence of large chemical and mechanical industries which come into play as purveyors and consumers of the metallurgical industry, remind me greatly of Europe. Generally speaking, wages as well as the cost of living are essentially higher and the price of coal is lower than with us. At Pittsburgh, for instance, iron works are able to obtain a good coal at from 75c. to $1 per ton and can, therefore, easily make their own coke for about $2, while the workman is earning from $3 to $4 per shift.

American Practice on Greater Scale

Again, while in Europe, our metallurgical works are based, for the most part, on the exploitation of ore deposits of comparatively small extent, and while we are dependent for our ore supplies on far-away countries, America has to deal with gigantic ore deposits to which equally large mine and reduction plants correspond. At the head of American mining and metallurgical enterprises are companies with enormous funds, fine organizations and an admirable spirit of enterprise at their command. That smaller enterprises may be harassed and injured by these mammoth companies is obvious.

On the other hand, it must be conceded that many a mine or reduction works could not be operated or conducted with financial success without the large resources of those big companies. Moreover, I have gained the impression that even the most powerful companies have to acknowledge the right of existence of their smaller competitors in order to avoid coming in conflict with the anti-trust laws.

Leaving out the Eastern part of the United States the reduction works are situated far away from chemical centers of consumption. The consequence is that in working ores and byproducts, certain essential constituents cannot receive such treatment as we are wont to give them in Europe; for example, a utilization of the huge quantities of sulphur in the ores cannot be thought of in many cases, although the volume of sulphurous-acid gases discharged into the air is in places enormous. In my travels I have gone through works in which, for instance, as much sulphur passed into the air in the form of sulphur dioxide as would easily have produced 1000 tons of sulphur trioxide per day.

However, the escape of such a large quantity of sulphurous-acid gases cannot be helped unless the operation of mine and reduction works were stopped entirely. But, since the mining interests in those districts are paramount, they have the first right to a free development and existence. If once the mines are exhausted the ground will, in all probability, be made available for farming or like purposes. It is self-evident that in those places provisions should be made to protect not only the employees, but also the inhabitants from damages by acid gases.

In the reduction works where there is a possibility of profitably disposing of sulphuric acid—as, for instance, at Ducktown, Tenn.—the latter is saved and finds a market. These works produce daily about 550 tons of 60° Bé. sulphuric acid, which is used for the preparation of super-phosphate with such economical success that the said works are reported to make their copper indirectly cheaper than any other. What I have said about the frequent non-utilization of sulphur holds equally good for other material, as low-grade arsenic and zinc ores, etc., which cannot stand heavy freight expenses.

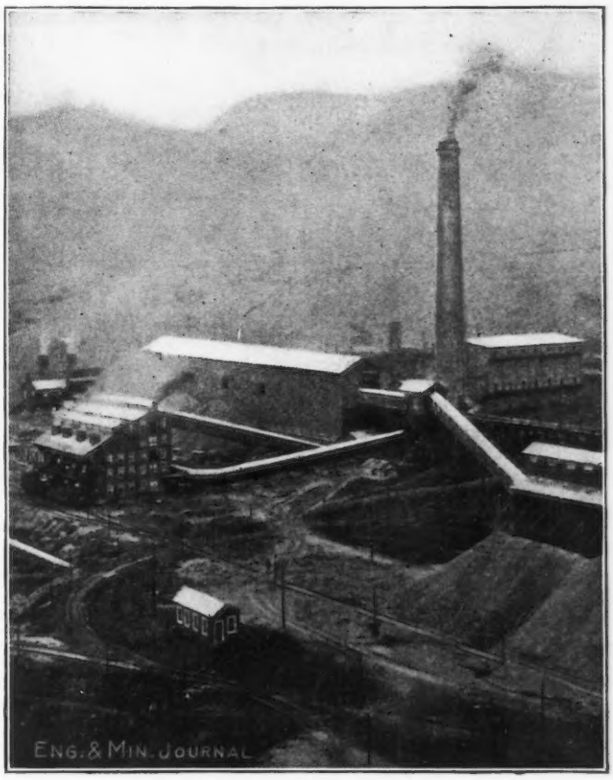


Fig. 1. Typical American Smelting Plant
Note bag houses and stack.

Waste of Coking Byproducts Indefensible

While nothing can be said against the frequent and justifiable non-utilization of sulphur and other materials, there obtains in other branches, for instance, in coke manufacture, a great waste by non-recovery and non-utilization of byproducts. During the excursion of the members of the Eighth International Congress of Applied Chemistry on the Monongahela River, near Pittsburgh, the conductor of the party called their attention to the fact that the steamer has just passed a battery of 2500 beehive coke ovens. It is well known that in these ovens

Note—Abstract by O. H. Hahn, of F. Heberlein's "Eine Exkursion auf nordamerikanische-mexikanische Blei-, Zink- und Kupferhütten," in "Metall und Erz," 1913, p. 717.

not only all of the gasifiable constituents of the coal are lost, but also a portion of the carbon. Modern coking ovens are, however, rapidly coming into use in the United States, principally those of Otto, Koppers and Solvay. I have often wondered why the large copper- and lead-smelting works which treat thousands of tons of ore per day and consequently must consume 200 tons of coke and upward, have not gone to work and erected coking plants of their own in connection with their works. Even if benzol and ammonia should not be saved, the application of gas and tar for generating steam would tend to cheaper working. While many reduction works are situated in the same locality as the mines, the smelting plants, which subsist entirely, or at least partially on purchased ores, are nearly always situated at junctions of several railway systems. The reason for this is the easier delivery of all materials and that the reduction works will be enabled to secure cheaper freight rates from competing railroads (not owned by the government). For longer distances these railroad companies make cheaper rates than for short ones. Thus it is possible for a smeltery in Missouri to compete with one in Colorado in the purchase of ores in Montana, at least as far as freight rates are concerned.

It is surprising to Europeans to notice that the inland waterways are so little used in the movement of large shipments of ore and coal; in part, this is owing to the irregular and poor conditions of river navigation even on the largest rivers like the Mississippi, Ohio and Missouri, partially also to the tactics of the powerful railroad companies, whose interests are opposed to cheap river freights. In the use of transportation by water, we Europeans are undoubtedly far ahead of the Americans.

The quantities of ore treated at American lead and copper works are disproportionately larger than those at our European works. The smallest lead-smelting plant which came under my notice treats much more ore than the largest European works that I know of. The mastery of such huge quantities of material has forced American metallurgists to pay as much attention to the movement of materials as to the metallurgical part of their work. For this reason the most perfect contrivances for the cheap movement, loading, crushing and conveyance of smelting material have been devised. There are, for instance, gondola railroad cars, having a loading capacity of 50 tons. The upper part is made of steel plate and nearly all of them are provided with an automatic bottom discharge. For the internal transportation of freight, generally electric locomotives, large overhead traveling cranes, belt conveyors and similar appliances are used. In this regard we could learn something from the Americans.

Treatment of Liquid Products

Liquid materials, as slag, matte, molten lead and liquid copper are moved in vessels of larger or smaller size after the fashion of ladles and slag pots in iron works by locomotives or traveling cranes at great speed. The ladles for copper are, of course, adapted to the capacity of the converters and sometimes hold as much as 30 tons, slag pots usually carrying from 5 to 10 tons. At one works we saw one of 30 tons capacity. The staff of the works thought this too large, however. The slag pots are ordinarily emptied by tapping through a slag hole, which is about 25 cm. above the lowest point of the pot. The shells with any matte that may have settled at the bottom are returned to the furnace while the liquid slag is poured over the dumps. In some places slag, as well as matte, is granulated in water and washed in a flume to its destination.

The liquid lead of the blast furnaces is run periodically from the automatic tap into lead pots, mounted on wheels, and from these poured into a large collecting pot for the removal of the scum. For the transfer of liquid lead from one pot to another or to the softening furnace, centrifugal pumps made of iron are frequently used. These are suspended in the lead pot and actuated by electric motors. Such a pump can raise 5 tons of lead per minute, 10 ft. high. In most of the works air-compressor plants may be found, and pipelines with compressed air are conducted through all the buildings in order to be ready for use for any purpose that might offer itself. For instance, hammers for breaking up material are driven by compressed air, and air lifts for raising small loads such as lead and copper bars into cars or refining furnaces are connected with these pipe lines. In high buildings even the workmen are lifted to the high levels by machinery.

Novel Works Elevator

In a concentrating and sampling mill in Colorado, which disposes of about 1000 tons of ore per day, an elevator similar to a bucket elevator runs through all four stories of the building at a lively gait. It consists of a stout vertical canvas belt to which handles and steps are fastened. Otherwise the belt is, like that of a bucket elevator, in constant motion, and the workman who wishes to descend from an upper to a lower story, for instance, quickly seizes the first handle that comes in sight, at the same time placing one foot on the step under it, drawing the other after him and disappears instantaneously in an opening of the floor.[1]

As the source of power in metallurgical establishments, etc., the reciprocating engine is almost exclusively used. While we in Germany and also in other parts of Europe have replaced the older types of engines by modern aggregates, especially by large units of steam turbines, I found in the more remote reduction works a good many steam engines of older construction and of small size.

As blowing engines, Green blowers coupled directly to upright engines were preferably used. In many works special attention is paid to the blast consumption of the different furnaces. At the works of the Cia. Minera de Peñoles, Mapimi, records have been kept for many years of the quantity of blast consumed per ton of ore. By constant comparisons not only deficiencies in the blast pipe and losses in the tuyeres have been detected and remedied, but, in the course of time, essential savings in the cost of blast per ton of ore have been effected through this means. In my opinion this practice ought to be emulated by us in Europe.

A peculiar feature of works located at high altitudes in the Rocky Mountains, due to the climate, is the so called thawing houses. These are long sheds in which from 8 to 10 railroad cars loaded with frozen ore may be housed in winter time. These thawing houses have mostly double walls, and if possible a double roof, and are heated by steam or by a direct coal fire conducted through

[1] An elevator of this description is still in operation at the Mansion House Chambers, London, Eng.

a long and centrally located flue. In other places small coke stoves are placed in the railroad cars containing frozen ore, and the ore is thawed out through them. It is obvious that the storehouses are also arranged with heating appliances. In American smelting works the sampling arrangements play an important part. On account of the huge quantity of ores and smelting materials which are delivered every day, the sampling is mostly done by machinery; but where small and widely varying lots are received, hand sampling is still in vogue.

A mechanical-sampling plant connects directly with an unloading contrivance, which passes all large lumps through a common large-sized rock breaker, which, in its turn, is in connection with quartering machines like the Vezin or the Snyder sampler. Smaller rock breakers, rolls and sample grinders pulverize and reduce the samples gradually to the size required for the final sample. A model plant in its details is the Golden Cycle mill, in Cripple Creek, near Colorado Springs.

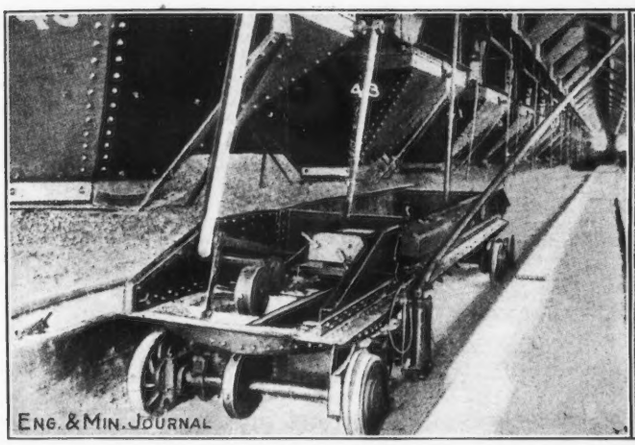


FIG. 2. CHARGING CAR AND ORE-STORAGE BINS, TOOELE, UTAH

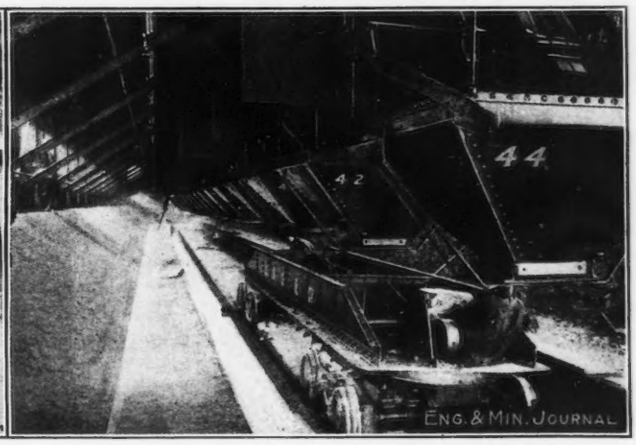


FIG. 3. CHARGING CAR RECEIVING AND WEIGHING CHARGE

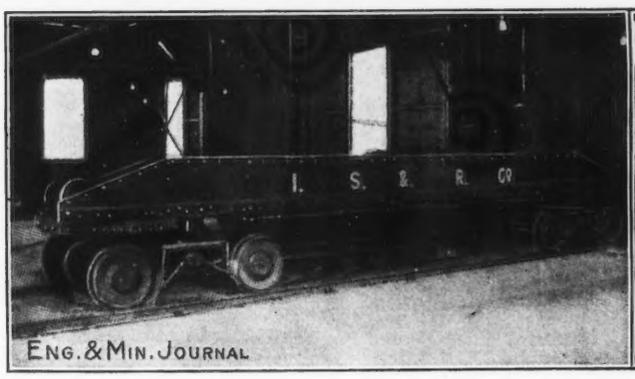


FIG. 4. CHARGING CAR READY TO DISCHARGE INTO FURNACE

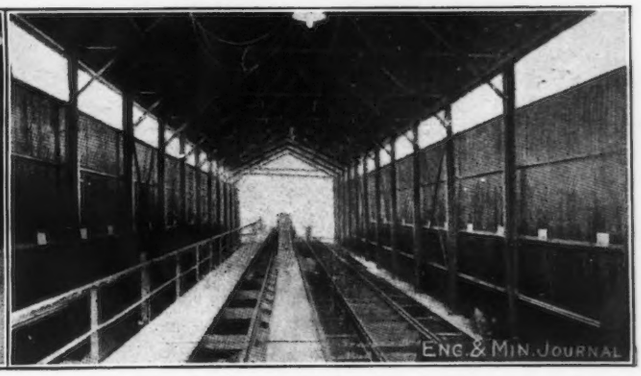


FIG. 5. MESSITER RECLAIMING SYSTEM

LABORATORY EQUIPMENT

As regards the modern metallurgical laboratories these are in part arranged finely and handily. Everywhere the electric current is employed at a large scale, for instance, for ignition and incineration, for preparing and keeping distilled water hot, for heating sand baths, drying ovens, etc. What is principally aimed at is to have laboratories with furnaces producing the least possible amount of dust and to save in human labor wherever there is a chance. In this connection, I might remark that the determination of lead in ore as well as in slag is made almost exclusively in the wet way by volumetric analysis, while that of silver is made in the dry way by scorification and cupellation. Copper is determined either by volumetric analysis or electrolytically.

FURNACE CHARGING

In making up a smelting mixture of the different ores, an addition of barren fluxes is avoided as much as possible. The preparation of a proper and uniform smelting mixture is, therefore, of greater importance in American works than it with us. In many cases it is not difficult, as a good many works receive large quantities of homogeneous ores. In works, however, which rely entirely on custom ores and where the delivery is irregular, the preparation of a smelting mixture is not so easy a matter. In order to be able to maintain uniformity in such a plant, it is advisable to keep in hand a good supply of well mixed ore lots. In one of the newest plants, the Tooele lead-copper smeltery, the different ores and fluxes are stored separately in a large number of bins made out of iron plate, which are located in one continuous row (Fig. 2). Under the discharge of each hopper a sheet-iron box is loosely suspended, which is connected with an automatic scale. The exact quantity of ore or flux desired is emptied into these boxes from the different bins. An electric charging car is now run under the boxes which are filled with ore and a man empties the

contents of each along the whole length of the long, narrow charging car (Fig. 3). After having thus obtained a good mixture of all component parts in the proper proportion the car is now run on the charge floor of the roasters or over the mouths of the blast furnaces, as the case may be (Fig. 4).

The doors closing the tops of the furnaces are now opened by the car man by means of a lever and the contents of the car are dumped into the furnace. The doors of the furnace close themselves again and the car is run back. In this manner two men per shift suffice to handle the whole smelting material of a furnace of 250 tons capacity per day. The arrangement just described is, of course, only applicable to a plant built in terraces. In all the works located on level ground, the smelting material is conveyed to the blast furnaces almost entirely on inclined planes. At various works the Messiter system is used for making a homogeneous smelting charge. Large level areas are so arranged that belt conveyors with movable discharge trolleys will cover the whole surface of the area uniformly with material. At the large works of Douglas, Ariz., the different ores and flumes are deposited in large, long ditches, which are about 6 m. wide by 4 m. deep. The several materials loaded on railroad cars are run along one side of the ditch, dumped into it and thereby form even layers or strata. A track on the bottom of the ditch carries a steam shovel, by which the smelting material is transferred to large-sized dumping cars set up at the other side of the ditch. These cars are run over the furnace tops and by tilting them the charge is dumped into the furnace without any further use of shovels.

In regard to the roasting appliances used in the reduction of lead, copper and zinc ores, the following may be said: The historic Freiberg long-hearth furnaces have disappeared almost entirely. I found them only in two works in Mexico and Colorado, and even there they are doomed to oblivion. The same is the case with the Brückner cylinders at one time so widely used. They have been superseded, particularly in works where lead ores, complex ores and matte are treated by the Hunt-

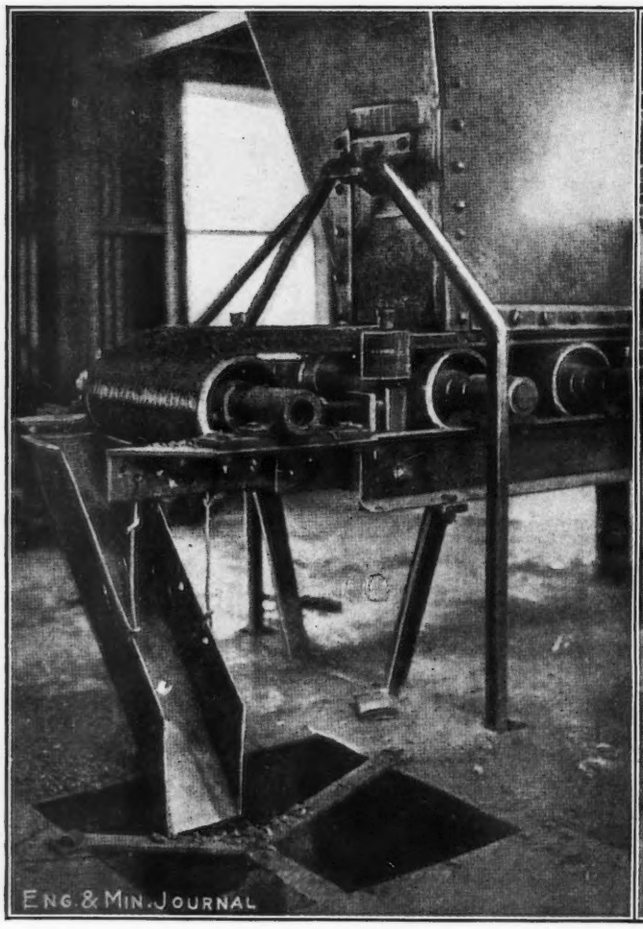


FIG. 6. DISCHARGE FROM DWIGHT-LLOYD ROASTER

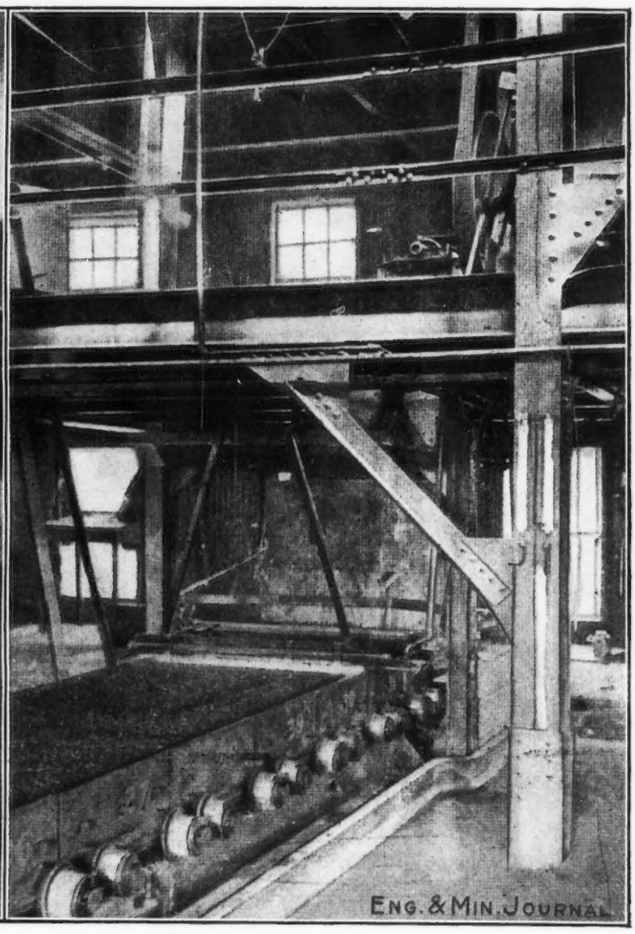


FIG. 7. DWIGHT-LLOYD STRAIGHT-LINE ROASTER

ington-Heberlein circular furnaces and in connection therewith the Huntington-Heberlein converters.

In one lead smeltery of the Missouri district, the pure lead ores with dolomitic gangue produced there were formerly roasted by the Savelsberg process. The roasting plant on the Huntington-Heberlein principles, as operated in the United States, differs in construction from those used in Europe and Australia. While we usually have our blowing apparatus standing on a high level, from which the roasted chunk is removed by tilting the apparatus, the so called H.-H. converters in the United States are mostly sunk in the floor. The converters which hold from 10 to 12 tons of material to be roasted are covered by a dome, from which a tube or flue is run off sideways to the main stack. In emptying these con-

verters, a traveling crane is used, which lifts off the dome, brings the converter to a dumping area and tips it over in the air.

The larger lumps of the block dumped are drawn into rock breakers and crushed to head size. The empty converter is conveyed by the traveling crane in front of an H.-H. rotating furnace and the bottom screen covered there with about 1 ton of hot preroasted ore, after which 3 tons of moistened, cold, raw ore with up to 20% S and 10 to 15% of Pb are added and the converter is brought back to its blowing place. After turning on the blast, roasting proceeds, and later more raw ore is added as it is needed. The generation of heat in the H.-H. converter is greater than in the Dwight-Lloyd apparatus.

It is, therefore, possible to roast to a finish and sinter material with a lower sulphur content. If the generation of heat by excessive quantities of sulphur should be too great, the excess of sulphur may be removed, either by better preroasting or reduced by a larger addition of ores devoid of sulphur, spent pyrites, limestone, etc. In this manner even hard fusing ores and products may be sintered in the H.-H. converter. In roasting the pure lead ores of the Missouri district, it would be in conformity with European and Australian practice to add silica-, iron- and lime-bearing ores or fluxes during the preliminary roasting in order to cut down the work of the blast-furnace to a mere reduction of the lead and silver and a remelting of the slagged compounds.

The Americans, however, are not inclined to expose the lead ores to two roasting operations, viz., the preliminary roasting in the H.-H. rotating furnace and the blowing in the converter or the Dwight apparatus, but prefer to blow these ores, without any fluxes except some silica, in their green state. Hence, the fluxes of lime and iron have to be added in the blast furnace. The roasting expenses at American reduction works are, therefore, cheaper, but qualitatively the work is poorer than ours. During the last few years at a number of smelting works, the Dwight-Lloyd continuous apparatus are coming into use (Figs. 6 and 7). For self-burning ores, that is, pyrites, Herreshoff, Wedge and Klepetko furnaces are employed almost exclusively.

(To be concluded)

Recovery of Tar by the Cava Process

In a paper read before the Iron and Steel Institute in September, 1913, Mons. Gevers-Orban, of Liège, points out that if a metallurgist makes his own coke, in the proportion of one ton for each ton of pig iron, he will also produce 100 lb. of tar, which is worth about 1s. 8d. This tar has commonly been handled only by regular tar refineries, costing to erect about £1 per ton of annual output; the Cava process, operated at the Bonne-Fortune collieries, Montegnée, having a capacity of 6000 tons per year, on the other hand, cost only £2400 to install, and occupies a building having an area of only 39 sq.m. The advantages of the Cava process are: (1) The operation is continuous, in the discharge of pitch and of volatile oils. (2) Distillation is aided by evaporation due to air currents, which increase the efficiency of the furnace. (3) The oxidizing effect of the air current increases the binding qualities of the pitch product.

In connection with iron metallurgy, the products of a tar distillery are of value in several ways: (1) The coke-oven tar is readily converted into binder suitable for compounding converter linings. (2) The volatile oils are excellent fuel for reheating, annealing and hardening furnaces. (3) The pitch is a cheap and excellent binder for ore-dust briquettes.

Mount Lyell

The report of the Mount Lyell Mining & Railway Co., Mount Lyell, Tasmania, for the half-year ended Sept. 30, 1912, shows that 157,296 dry tons of metal-bearing ores were treated. The total blast-furnace charge amounts to 166,190 tons, as shown in the following table:

BLAST-FURNACE CHARGE FOR HALF-YEAR ENDED SEPT. 30, 1912

Material	Dry weight tons	Copper %	Assay value Silver, oz.	Gold oz.
Company's ore	157,167	2.45	1.58	0.026
Purchased ore	46	....	....	....
Metal-bearing flux	83	1.62	0.27	Tr.
Flue dust	3,393	4.28	2.74	0.055
First matte	498	29.91	19.89	0.371
Converter slags	4,469	....	....	.....
Converter linings	534	....	....	.....
Total	166,190			

Of the 157,167 tons of company's ore, 96,936 tons came from the opencut and underground workings of the Mount Lyell mine and 60,231 tons from underground works of the North Mount Lyell mine. The converter treated 7545 tons of matte averaging 45.95% Cu, 31,33 oz. Ag, and 0.61 oz. Au; producing 3161 tons of blister copper containing 3124 tons of copper, 213,285 oz. of silver and 4316 oz. of gold. The net profits for the half-year amounted to $518,801 after crediting $78,608 for revenue received from railroad traffic and $2804 for interest receipts. The costs were as follows:

MOUNT LYELL—COSTS PER TON OF ORE

Item	Per ton ore
Mining charges	$2.32
Overburden account for openpit mining and development charges on ore won	0.11
Smelting expenses	2.09
Converting expense	0.27
Railway traffic expense, maintenance, etc	0.42
Freight and charges on copper	0.60
Local and London offices, directors' fees, exchange and bank charges, insurance, etc	0.27
Mine prospecting	0.18
Taxes on dividends and income	0.18
Depreciation	0.30
Total	$6.74

At the Mount Lyell mine 48.6c. per ton is charged on ore raised from openpits to cover the expense of stripping overburden. On ore secured from underground workings a charge of 8c. per ton is made to cover development expense. As stated in the table given, 166,190 tons of charge were treated in the blast furnaces, based upon this tonnage the smelting cost was about $2.02 per ton of charge treated. The cost of converting or bessemerizing, not included in the smelting charge, was about $5.64 per ton of matte treated. Net income from railroad and interest receipts amounted to about 9.5c. per ton of ore treated and has not been deducted from the costs as given. The ore reserves were reported to contain 3,444,944 tons of ore, 2,361,182 tons were credited to the Mount Lyell mine and 1,083,752 tons to North Mount Lyell mine. This ore is considered available for extraction. The company purchased the Mount Lyell Comstock Copper Co.'s property and upon closing down the North Mount Lyell mine on account of fire necessary steps were undertaken to make the Comstock ore available for extraction. Work was also started on Lyell Tharsis orebody by opencut. Dividends have amounted to $13,445,549 to date of Sept. 30, 1912.

The Mysore Shaft Accident

Our readers will probably remember that a disastrous accident occurred in the Edgar shaft of the Mysore mine, on the Kolar field, recently, whereby 42 persons traveling in a cage were killed. The following is the preliminary report on the accident by Dr. Smeeth, chief inspector of mines, (*Min. Journ.*, Oct. 11, 1913):

About 7 a.m., on Aug. 21, the south cage in Edgar's shaft fell from 100 ft. below the surface to the bottom of the shaft, a distance of 2600 ft. The cage has two compartments, one above the other, in each of which 25 men are permitted to travel. At the time of the accident there was altogether 42 persons in the cage—viz., six Italians, two Eurasians, and 34 natives, all of whom must have been killed instantaneously when the cage reached the bottom of the shaft. When the cage fell away, at 100 ft. from the surface, it was on the downward trip, and traveling at some 1200 to 1300 ft. per minute.

Edgar's shaft is a vertical circular shaft which was completed and equipped about two years ago. The cages run up and down on steel guides without safety catches. There are two cages, one of which ascends as the other descends, each cage being suspended by a flat steel rope passing over a pulley at the top of the head-gear and led from thence into the engine room, where it is coiled around a flat drum some 16 ft. in diameter. Each reel is mounted on the main engine shaft, but is not rigidly fixed to the latter. While winding is going on, the reel is secured to the main shaft by means of a clutch, which in the present engine is in the form of a steel band, lined with wood, acting on a drum—very like a band brake. One end of this steel band is attached to a fixture on the shaft, through an adjusting link for taking up wear and regulating the tension of the clutch band. The accident was due to the snapping of this link, which released the clutch and left the reel, on which the winding rope is coiled, free to revolve on the shaft and therefore disconnected from the engine. The link which snapped is in the form of a bolt 3⅜ in. in diameter, made of mild steel and appears to be amply strong enough. When I inspected the engine the day after the accident, the broken pieces of the link were still in position, and the fractures were perfectly clean and fresh. There was no appearance of any flaw, but it is impossible to say whether any molecular alteration may have been set up without further examination.

Each reel is provided with a powerful post brake which is capable of controlling the rotation of the reel, whether the latter is clutched to the shaft or not under ordinary working conditions. These brakes appear to have been in perfect working order, and are in constant use every day. At the moment when the link snapped and the south reel became unclutched from the main engine shaft, the south cage with 42 men was 100 ft. below the surface, and the north cage with 21 men in it was 100 ft. above the bottom of the shaft, the former descending and the latter ascending. The engine-driver, J. Jenkins, heard the snap of the link, and, without being able to recognize what had happened, he immediately cut off steam and applied the two brakes, which are worked by two small engines. The promptness of this action is shown by the fact that the north cage was brought to rest 150 ft. above the bottom of the shaft, so that it traveled only 50 ft. after the snap took place. In other words, after the snap was heard the engine-driver cut off steam, applied the brakes, and brought the north cage to rest within a space of a few seconds, and the cage with its burden of 21 men remained suspended in the shaft for three hours or so until it was ascertained that it was safe to lower again to the bottom. In this case the weight of the cage, rope, etc., helped the brake to overcome the momentum of the moving masses.

In the case of the south cage, which was descending, the whole work devolved upon the brake, which failed to bring the reel and the cage to a standstill. The friction of the brake-blocks on the brake drum of the reel was so great that the wooden brake-blocks were charred and the engine room filled with smoke in a few seconds. The engine-driver stuck to his post, though he could do nothing further, while the reel revolved in a cloud of smoke, and after the cage had struck the bottom the rope continued to pay out until some 14 spare coils were unwound, and finally the plates and bolts which attach the rope to the drum of the reel were torn off and disappeared through the roof of the engine house.

The engine is in the charge of Mr. Kendall, one of the assistant engineers, and is subject to regular daily inspection. So far as I can see, there is nothing whatever wrong with the brakes or the clutches or anything else, and the sudden failure of the adjusting link is one of those unforeseen contingencies which it is not possible to account for at present. On the other hand, this accident must raise questions as to the mechanical soundness of the particular type of clutch employed and as to the efficiency of the types of brake now employed on large winding engines with heavy loads and working at great depths. The question of brakes has already been the subject of protracted discussion in various parts of the world, and is by no means finally settled. I have followed the discussion from time to time, but have no wish to intrude my own opinions upon such a technical specialty. The fact remains that the brake failed to bring the descending cage to rest under conditions which are by no means so arduous as those which might obtain in many cases, where quick winding of heavy loads has to be undertaken, and that accidents affords a definite and terrible object lesson which requires the fullest investigation. The question of the type of clutch and of the nature of the fracture of the link also requires further consideration.

As soon as the necessary details are available I propose to obtain a fuller discussion of the particular conditions of this accident both by the engineers on the Kolar field and by outside authorities on this particular subject. In the meantime, work will be resumed as usual, but the adjusting links on both clutches will be replaced and constructed of slightly larger section, if possible.

As regards safety catches for holding up the cage in case the rope breaks, permission has been given to work the cages without safety catches, as there was no safety catch known which was regarded as reliable and effective and free from grave objections. The practice of working such cages without safety catches is the usual one followed in other mining centers after exhaustive inquiry and experiment. In the present case it may be noted that the rope did not break, and was probably under considerable tension all the time the cage was descending the shaft, and that consequently no automatic safety catch would have been of the slightest use in averting the catastrophe. The accident is a most unusual one, and a repetition of it need not be anticipated.

⁂

Solution of Gases in Metals

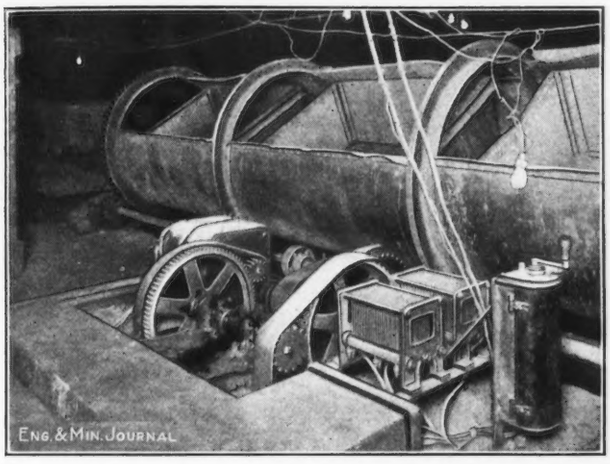
At the recent meeting of the British Association for the advancement of Science, Dr. A. Holt read a paper on "The Solution of Gases in Metals," dealing chiefly with experiments by Dr. J. H. Andrew and himself concerning the occlusion of hydrogen by palladium (*Engineering*, Oct. 10, 1913). His former experiments, he stated, had shown that there was a change in the occlusion at about 100° C., and that absorption by the surface and diffusion into the interior, taking place at different temperatures, had to be distinguished. The subject was still obscure. They had heated palladium foil, palladium black (obtained by igniting the palladium ammonium chloride) and a button of fused palladium in an electric furnace, consisting of a porcelain tube, jacketed outside with copper, *in vacuo*, in hydrogen and in air, and had examined the heating and cooling curves taken with the aid of thermo-couples of platinum and platinum-iridium. The results confirmed the assumption that palladium was dimorphic, and that the transition of the one phase into the other was extremely slow. Under certain conditions, in the cold, the surface layer rapidly occluded much gas with considerable evolution of heat. An amorphous surface layer seemed to be wanted for this reaction, for under other conditions the metal appeared almost passive as regards gas absorption. Above 100° C., however, hydrogen was always occluded, but in small quantities and with the evolution of a constant amount of heat; above 150° C., the two forms, the amorphous and the crystalline, had the same affinity for hydrogen.

Dr. Rosenhain remarked that on his amorphous cement hypothesis, a worked or a rapidly cooled metal should have a greater absorptive power than a slowly cooled metal, and the same relation should hold for fine grains and coarse grains.

DETAILS OF PRACTICAL MINING

Motor-Driven Three-Car Tipple

The accompanying photograph represents an underground tipple installed at the Joker shaft of Witherbee, Sherman & Co., Inc., Mineville, N. Y. The motor driving the tipple is a 20-hp. machine, operating under 220 volts. A quadruple reduction of speed between the motor and the tipple is effected by a train of gearing on three countershafts. The tipple handles at one time three of the regular motor-hauled underground tram cars.



MOTOR-DRIVEN THREE-CAR TIPPLE

Preservation of Wood Pipe

The many advantages of wood pipe for water transportation are somewhat offset by its liability to rapid decay. It has been demonstrated, says *Engineering and Contracting,* Oct. 15, 1913, that the durability of wooden pipe depends entirely upon its continuous and perfect saturation with water and it follows that the pipe should be thin enough to insure penetration of the water through its pores at a more rapid rate than the loss of water by evaporation from its surface. The porosity of timber differs to such an extent that a proper thickness of shell of a red cedar pipe, for example, is too great a thickness for Washington fir. Obviously a thickness that is proper for a pressure of 40 lb. per sq.in. is too great for a pressure of 10 lb. per square inch.

Not until comparatively recently, however, have engineers begun to consider the external conditions that affect the life of wooden pipe. Enough instances of long life of wooden pipe buried in clay are on record to establish the fact that clay is an admirable preservative. The reasons for this are probably two-fold: (1) Clay holds moisture and thus insures continuous and thorough saturation of the wood at the surface of the pipe; and (2) moist clay is not a good culture bed for the growth of fungus that causes rot. In view of the preservative quality of clay, would it not be good engineering to incase wooden pipe with clay several inches thick? Where the clay is within comparatively easy reach, and particularly where the trench is in soil that is either very porous or contains much vegetable humus, it would seem that a clay jacket around wooden pipe would prove economical. A concrete jacket might serve a similar purpose, but ordinarily at a greater cost than clay.

Rear-Dumping Skip-Car

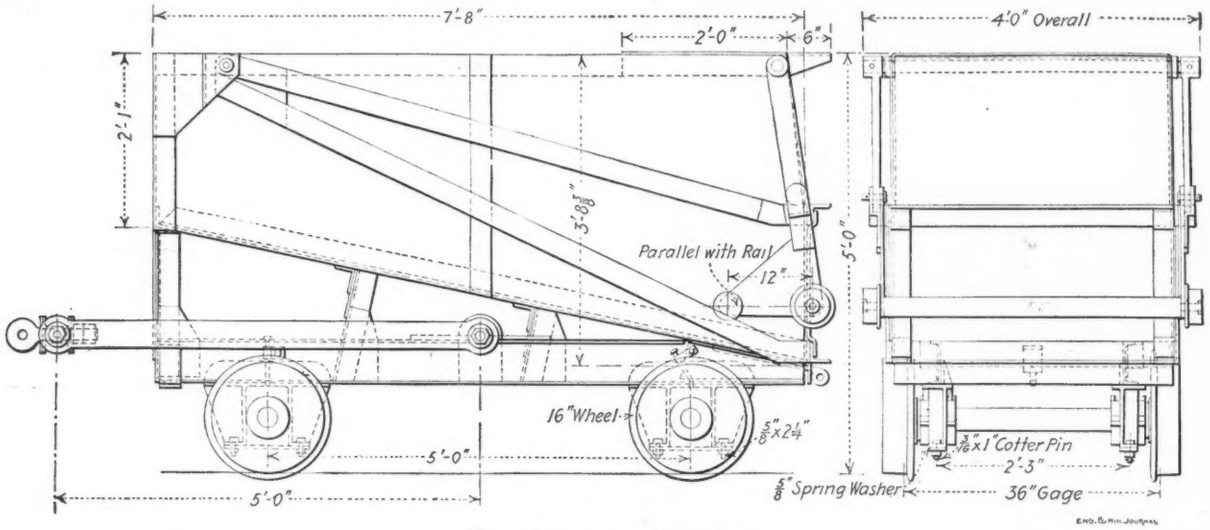
BY L. O. KELLOGG

At the Sterling mine, in Orange County, N. Y., the flat-dipping shaft and the limited room between the collar and the hoist make the employment of a special type of skip necessary. This is shown in the accompanying illustrations. It is really a car with an automatic door on the bottom end. The door is shown closed in the drawing and open in the photograph. Opening is effected by tripping, two small wheels coming into contact with a railing erected beside the track at the dumping point. The smaller wheel first comes in contact and unlocks the toggle joint. Then the larger wheel forces the lower half of the door to slide up outside the fixed upper half.

CAR IN PROCESS OF DUMPING

As the car descends again, the door is allowed to drop and is locked with the toggle mechanism. There is a double track with a tripping railing on each side and the tripping device on the cars is put on both sides, so that the cars can be used on either track.

The car body is built with its bottom higher toward the upper end. By this means sufficient slope is given to the bottom to discharge all the contents. The car, as used, hoists four tons of magnetite. It was built by the Kilbourne & Jacobs Manufacturing Co., of Columbus, Ohio, to fit the peculiar conditions existing, and is a unique type.



REAR-DUMPING SKIP CAR

❖

Square-Set Framing at Butte

In the earlier operations in Butte, Mont., timber was abundant for mining purposes, and it was common practice to use sawed lumber for the stope square-setting, the framing on this being relatively simple. There were, nevertheless, various methods employed for framing these square sets. In Fig. 1 is shown the framing used in the High Ore mine ("Timbering in the Butte Mines," A. I. M. E. Bull., August, 1913); the post has a long and relatively slender horn, subject to breakage under heavy side pressure, and to crushing with heavy top pressure. The opposite extreme is shown in Fig. 2, the framing used at the Syndicate group. In this case the horn of the post is only 1 in. high, which gives a small shoulder for the cap and girt. Furthermore, the framing is unnecessarily complicated, and consequently expensive. In Fig. 3 the method for the Anaconda group is exhibited. It is probably in general the best method for sawed timber, being cheap, simple, and designed to obtain the full strength of the timbers in all directions. The horns on the posts, being 6 in. square by 2 in., are strong, and at the same time give a good shoulder for the cap and the girt. The caps butt end to end. The girts in this figure are unnecessarily large, inasmuch as they lie parallel with the strike of the deposits and consequently take less weight than the caps, which are subject to the crushing force of the hanging wall. The framing shown in Figs. 4 and 5 is similar to this, except that the girts are 4 in. less in lateral thickness, and so require no framing at all, although leaving the set just as strong. One case shows the dimensions for 10-in. caps and posts, and the other for 12-in. Using the 10-in. timber the sets are made 5 ft. from center to center, either cap-way or girt-way, and 7 ft. 6 in. center to center in height.

As the timber about Butte available for sawing became scarcer, it was found necessary, in order to utilize the remaining forests, to adopt round timbers underground. Even before this, round timber had been used by the Gagnon mine. The method of framing employed here is that shown in Fig. 6. The posts and caps have horns 5 in. square by 2½ in., and the cap has a shoulder taken off the bottom 5 in. from the center to allow it to fit snugly on top of the post, while on the top, also 5 in. from the center, a slab is taken off for its full length, in order that a stope floor may be easily laid. The girt is framed as shown, being usually less than 10 in. in diameter. The sets are 8 ft. 3 in. from center to center in height, and are 5 ft. center to center in the two other dimensions. The framing used on the levels, shown in Figs. 7 and 8, is similar, except that the posts are given a batter of 6 in., furnishing additional resistance against side pressure.

A combination of round and square timber has been used at the Steward mine for a number of years. The caps are of square timber; the girts and posts are round. The dimensions and method of framing are shown in Fig. 9, while Figs. 10 and 11 exhibit the relations of the level timbering and the stope set. The horn on the post is 1½ in. deep on the bottom, and 3½ in. on the top, it being supposed easier to stand a post with a short horn when erecting the set. This necessitates that the horn of the cap be out of center; this does not weaken the cap, but the timbers, being unsymmetrical, are a little slower to handle. The sets are 7 ft. center to center in height, 5 ft. 2 in. center to center along the cap, and 4 ft. 10 in. center to center along the girt. The drift posts are framed on the top only, and are given a heavy batter, which has proved satisfactory. Fig. 10 also shows the method of putting in the sheeting on which the waste is filled. The height of this above the drift cap allows room for repairs when necessary. The material used for this is usually small round timber or large round timber sawed in half.

When round timber began to be more generally

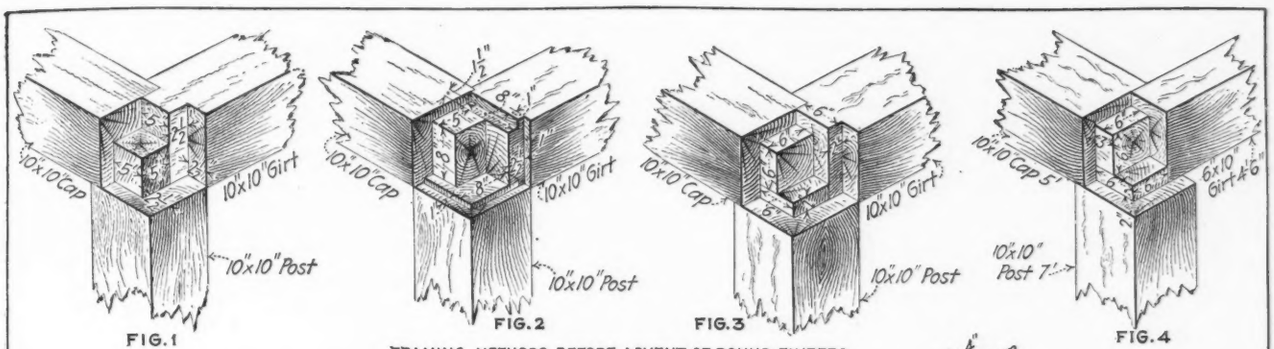


FIG. 1 FIG. 2 FIG. 3 FIG. 4

FRAMING METHODS BEFORE ADVENT OF ROUND TIMBERS

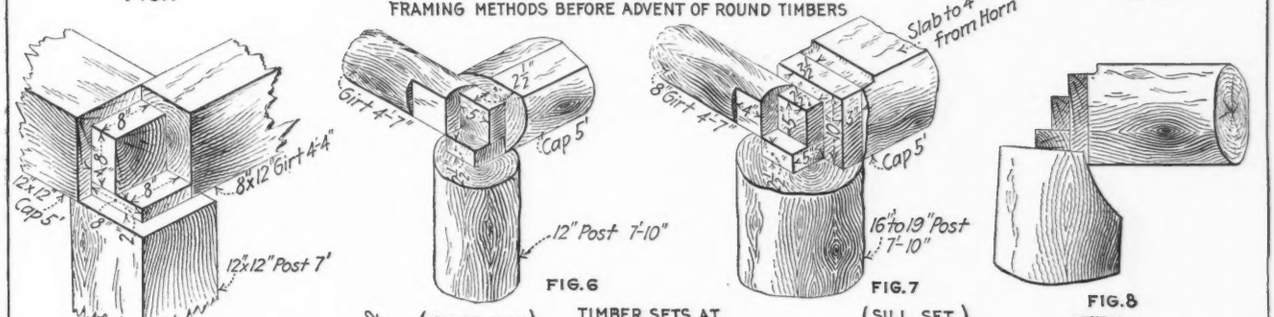
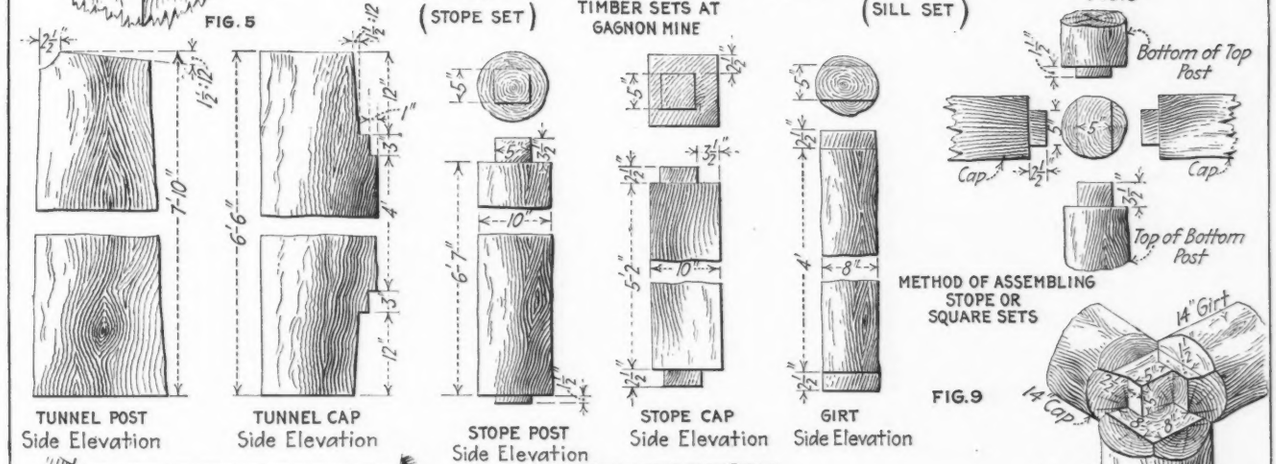
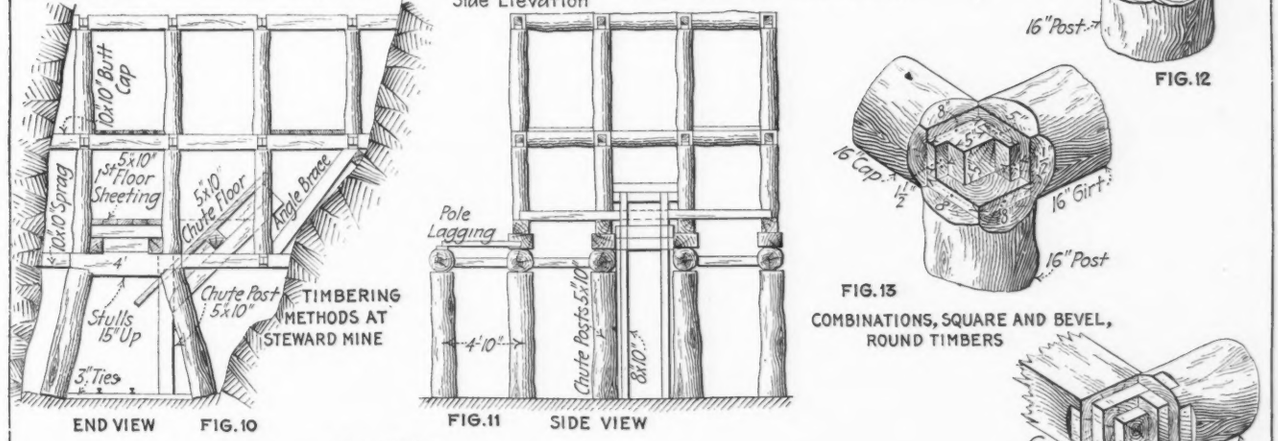


FIG. 5 FIG. 6 (STOPE SET) FIG. 7 (SILL SET) FIG. 8

TIMBER SETS AT GAGNON MINE





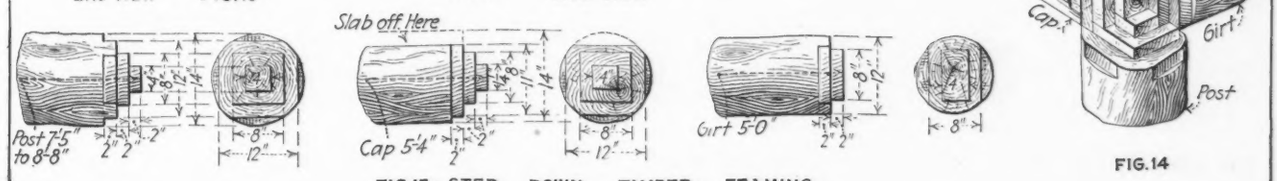


FIG. 15 – STEP DOWN TIMBER FRAMING

METHODS OF FRAMING AND ASSEMBLING SQUARE AND ROUND TIMBERS IN BUTTE MINES

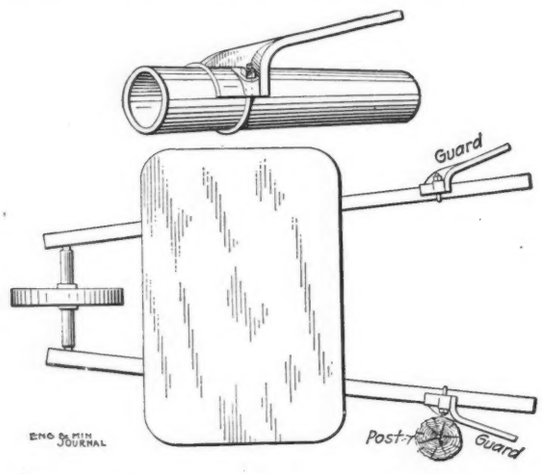
ENG. & MIN. JOURNAL

adopted, the first framing, done in machines, is that shown in Fig. 12, the post having a flat top, 8 in. square, with no horn, and with a miter cut to the outside of the timber. The caps and girts both had horns, as shown. While this style was used for some time, it was found difficult to set the timbers and to block them so that the sets would satisfactorily resist pressure, and the concussion of blasting. The first improvement was that shown in Fig. 13, a combination of the square and the beveled type. As can be seen, the framing of these caps is complicated, there being a 1½-in. shoulder at the base of the horn, from which the miter begins. The sets measure in height 7 ft. 5 in., and 5 ft. 10 in. either cap-way or girtway, in these latter two cases. A still further improvement is that shown in Figs. 14 and 15, the step-down type, the large 12-in. horn on the post being used when the post is large enough. The cap is slabbed off on the top in order to enable a level floor to be laid. In this style, the size of the set was also changed, it being made 7 ft. 9 in. in height and 5 ft. 4 in. in each of the other dimensions; being thus smaller along the caps and girts, it is stronger, and the common length of lagging used, 16 ft., will cut into three pieces to fit the sets and leave no waste.

It is probably the best method of framing round timbers where the size varies, the full strength of each member of the set being obtained regardless of the size of the timber. If the timber were all the same diameter, a simpler method could be used, somewhat similar to that shown in Figs. 3 and 4 for square timber. On the main levels, specially selected timber is used, varying from 12 to 18 in. in diameter for posts and caps. There is no difference in the method of framing except that the posts are framed on one end only. It is the intention ultimately to apply this method in all of the mines of the Anaconda Copper Mining Company.

Wheelbarrow Knuckle Guard

The dangers of septicemia is always present around mines and treatment plants. Any abrasion of the skin



WHEELBARROW KNUCKLE GUARD

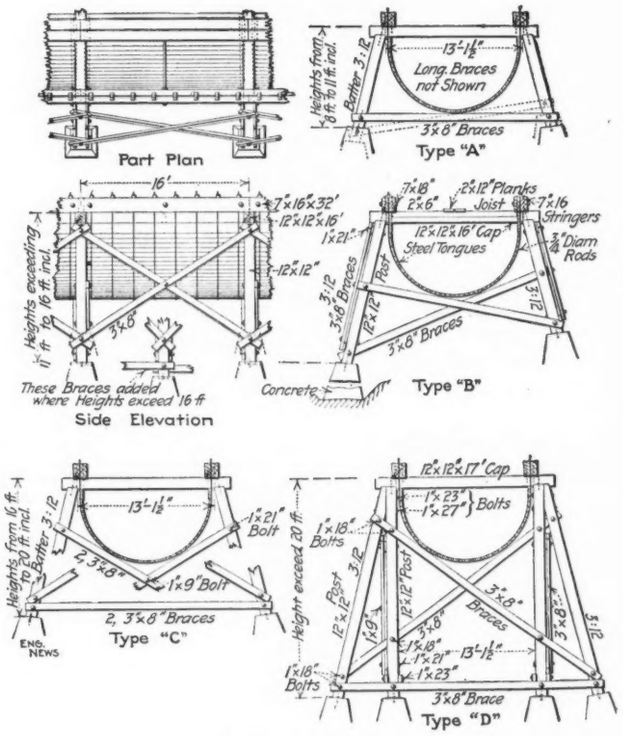
is, therefore, to be avoided. The accompanying illustration taken from the Inland Steel Co.'s "Safety Bulletin," is designed to prevent one frequent source of abrasion, namely, knuckles skinned while wheeling a barrow. The device is simple, cheap and effective.

Wooden Stave Semicircular Flume

A wooden-stave flume of semicircular section is used in the Puntledge River power development at Vancouver, B. C. The power will be developed for the Canadian Collieries (Dunsmuir), Ltd., of Victoria, which owns and operates a group of coal mines near Union Bay, Vancouver Island.

The wooden flume, states *Engineering News,* is built of staves laid on steel suspension rods carried by and between side girders laid on bents placed 16 ft. center to center.

The flume is approximately semicircular in shape, 12 ft. wide and 7 ft. deep. The staves are of 3x6-in. lumber dressed to $2\frac{9}{16}$x$5\frac{7}{16}$ in. The suspension rods are ¾



DESIGNS OF BENTS FOR WOOD-STAVE FLUME

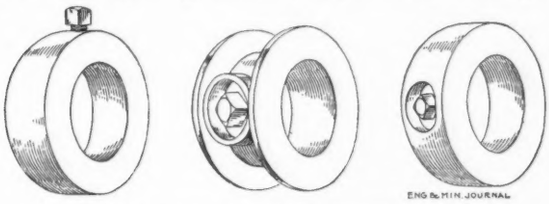
in. in diameter, are spaced 24 in. on centers, and are adjustable over each girder by screw ends with nuts over specially designed washers. The girders are built up of double fir timbers, 8x16 in., with space between, fixed by separators, for passing the suspension rods through. The flume bents are built on concrete piers except across a swamp where the girders are carried directly on piles driven to solid bottom. This design, which is shown in the accompanying illustration, was found to be economical and well adapted to rapid erection.

Wood was used for flume and supporting structures because of the general adaptability of the material to the local requirements. The design is such that any part of the support can be renewed without interrupting the operation of the plant. The flume itself, except for staves near the flow line, is under practically the same conditions as submerged wood and therefore of indefinite life. No trouble is expected in the maintenance of the flume proper, since a large part of it can be replaced without shutting down entirely.

DETAILS OF METALLURGICAL PRACTICE

Guarding Setscrews

The accompanying sketches from a Safety Bulletin of the Inland Steel Co. show an unguarded setscrew and two methods of protection. A setscrew would not seem likely to cause a fatal accident, but the case is given of a manager who, in opposing his safety inspector's protest against



UNSAFE AND SAFE SETSCREWS

an unguarded setscrew that was revolving nearby, gesticulated too wildly, had his coat sleeve caught by the very setscrew and was whirled to death. Furthermore, a setscrew on a rapidly rotating shaft in an exposed place is in excellent position to cause cuts and abrasions, which are often serious and always liable to cause death by infection.

❖

Oil-Storage and Distribution House

The illuminants, lubricants and gasoline of the Chateaugay Ore & Iron Co. are handled through one central station. This is a cast-concrete building, shown in partial section in Fig. 1. It measures 16x32 ft. outside, and has

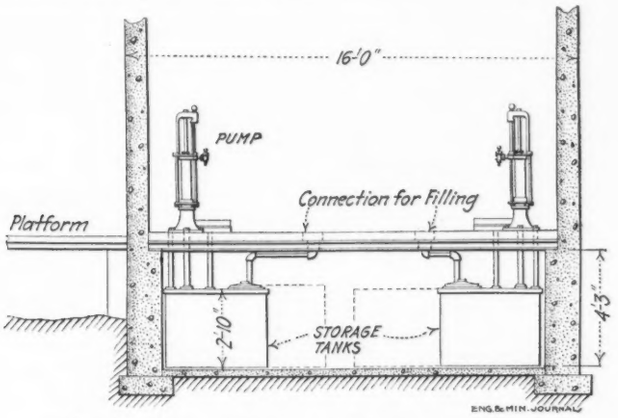


FIG. 1. ARRANGEMENT OF PUMPS AND TANKS

an arched roof, also cast of concrete. The lower portion or basement of the building is 4 ft. 3 in. high, and contains a series of tanks for the oils. The working floor of the building is flush with a platform, which is of suitable height to receive unloaded material from the railway cars. The barrels of oil are stored on the platform and are emptied as may be necessary through connections in the floor of the building into the tanks mentioned. The most interesting feature of the building is the method of drawing the oils from the tanks and of measuring them at the same time. For this purpose, there are used the S. F. Bowser self-measuring pumps, similar to those frequently seen in garages. There are 16 of these devices, which are illustrated in Fig. 2. Each pump consists of a handle, geared to a vertical rack, which operates the pump plunger. One stroke of the plunger in either direction can be set to deliver 1 pt., 1 qt., 2 qt., or 1 gal. of oil. There is an attachment for counting the number of

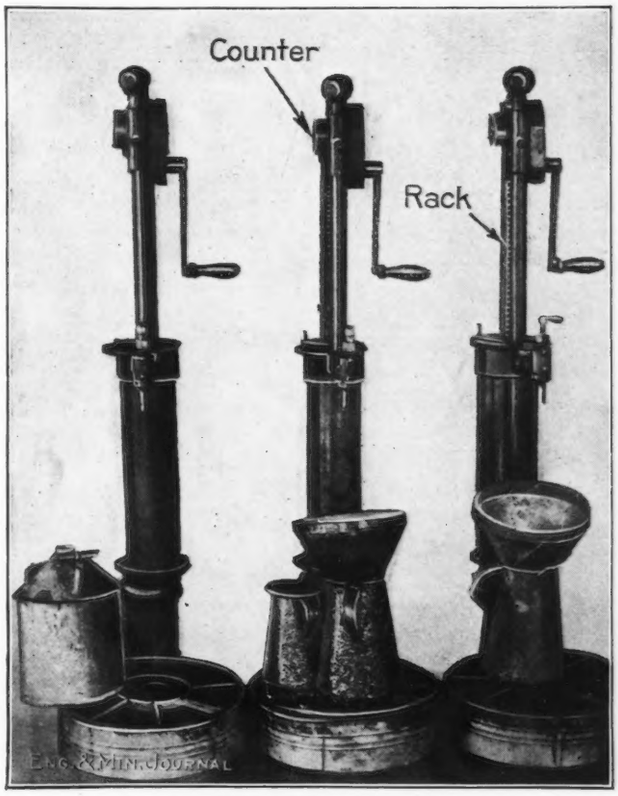


FIG. 2. SELF-MEASURING OIL PUMP

strokes, and thus the exact quantity issued at any one time is measured accurately and automatically. A rather large series of oils is thus handled, including air-drill oil, signal oil for the railroad, dynamo oil, gasoline, kerosene, black oil, engine oil, cylinder oil, compressor oil, etc. Greases and solid materials are issued by weight or by the piece. Thus, "Sunshine" is broken up into chunks about as big as a man's fist, of suitable size for carrying in the pocket. The whole installation is well designed, compact and convenient.

❖

Mills Combination Steel Furnace

A successful run of a new type of steel furnace at Frederick, Md., is reported by the *Frederick Post*. A high grade of steel is said to have been produced from low-grade material consisting of pig iron and scrap. The furnace, which is called the Mills combination, was in-

stalled by E. Cooper Mills & Co., for the Morris Iron & Steel Works. It is said to embody the best features of the openhearth, the side-blow converter, and the electric process.

In operation, the best results are believed to be obtained by first using the cheaper side-blow to do the roughing work and finishing the run with the openhearth or electric process, as desired.

❖

The Finn Elevator Bucket

With the object of devising an elevator bucket which will permit easy renewal of rapidly worn sections, and which will be a general improvement over those usually

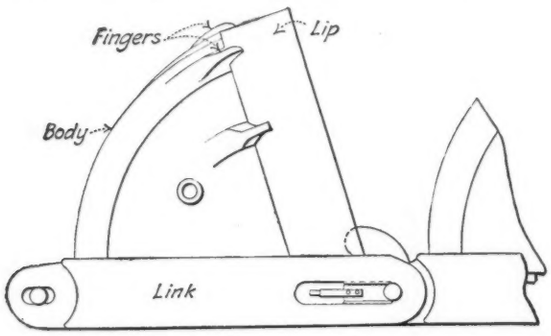


FIG. 1

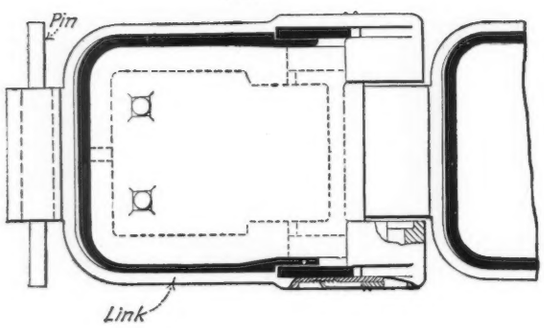


FIG. 2

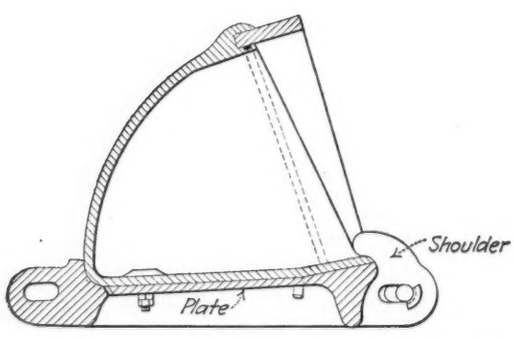


FIG. 3 ENG. & MIN. JOURNAL

FINN ELEVATOR BUCKET

found in commission, O. B. Finn, of Colorado Springs, Colo., has invented one and patented it under U. S. pat. No. 1,060,833.

In the formation of this bucket, a link of U-shape, shown in side view in Fig. 1, and in plan in Fig. 2, is used as a frame. At the lower end of this link is a projection, integral with it, having an oval hole bored through lengthwise. This projection fits into the open end of the next link, as shown in Fig. 2, and is held by the pin, which has an oval body, to fit the hole in the link end, and round ends.

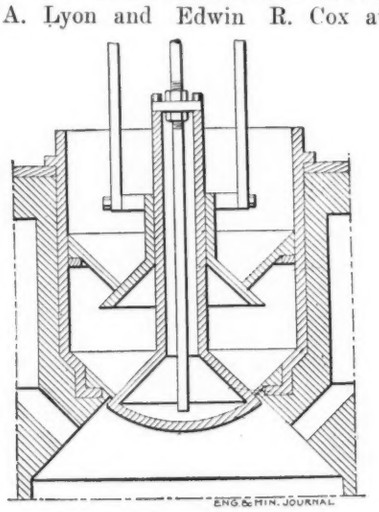
The body of the bucket seats on a plate which is part of the link. At its outer rim it has cast fingers which serve to receive and hold a removable lip. This lip is tightened in its position by fastening the bolts which hold the bucket-body to the link-plate. The bottom of the bucket body, at its front end, seats on the angular inturned edges of the lip, its front end being held in place by lugs formed on the link ends. A cross-bar connects the link sides at the open end to strengthen it.

The buckets are arranged to fit together with an easily moving joint, as shown in the drawings, the uniting of one bucket with another acting to force the pivot pin into its place and hold it there. These buckets find their principal use in dredging operations in gold-bearing gravels.

❖

A Trapped Charging Bell

The charging bell shown in the accompanying illustration is one used in the electric iron-smelting furnace of Dorsey A. Lyon and Edwin R. Cox at Heroult,



DOUBLE CHARGING BELL

Calif., in order to have the furnace trapped at all times. Both the purpose, construction and method of operation are completely shown by the cut. It seems to be one of those metallurgical ideas capable of a wide application.

❖

A Refractory Furnace Lining

For certain purposes a furnace lining of a refractory nature may be made from asbestos and water-glass, says the *Brass World*. It is useful for patching or plugging cracks as it does not crumble as readily as other similar compositions made from clay.

The material is made of the following:

Fine asbestos	40 lb.
Water-glass	60 lb.

The water-glass is the same as silicate of soda and occurs in commerce as a jelly-like mass which is soluble in water. The asbestos and water-glass are mixed with enough water to make the whole pasty so that it can be worked.

COMPANY REPORTS

Broken Hill Proprietary Co.

According to reports and statements of the Broken Hill Proprietary Co., Barrier Ranges silver field, New South Wales, for half-year ended Nov. 30, 1912, the company apparently made a net profit of $752,828 for the period. The gross income from mine products was $5,377,716, and working expenses for mines and plants, exclusive of depreciation and office charges, $4,437,412, leaving a working profit of $940,304. Depreciation, offices, directors' fees, taxes and general expenses amounted to $224,798. Income from interest, rents and investments was $37,322, leaving a balance of $187,476 to be deducted from working profit as reported. Dividends during the period amounted to $699,840. The crude-ore output was 120,839 tons. The lead-concentration plant treated 117,767 tons of crude ore, producing 24,355 tons of lead concentrates, assaying 58.29% lead and 27.18 oz. silver per ton.

In the zinc concentration plant 88,361 tons of dump tailings were reground, producing 3057 tons of lead concentrates assaying 52.18% lead and 27.48 oz. of silver per ton. The present stock of these tailings is about 1,150,000 tons. In slimes the joint production from both sections amounted to 28,676 tons, assaying 19.29% zinc, 13.88% lead and 16.4 oz. silver per ton. The smeltery treated in all 95,092 tons of ores and concentrates and 5513 tons of flue dust and refinery drosses. The production of bullion was 50,302 tons, which was a record production. The refinery treated 45,730 tons of bullion resulting in 2,059,197 oz. of silver, 872 oz. of gold, 43,578 tons of soft lead and 362 tons of antimonial lead. In the spelter plant 5012 tons of zinc concentrates and slimes were treated by the roasters, the distillation plant produced 1367 tons of spelter and 212 tons of blue powder. During 1912 the company sold 83,982 tons of lead as follows: To Europe, 46,512 tons; to India, China and Japan, 27,504 tons; to Australia and New Zealand, 9966 tons. The report claims 2,000,000 tons of ore available in the Broken Hill mine.

❋

Colorado Mining Co.

The Colorado Mining Co., of the Philippine Islands, made a profit of 315,776.20 pesos in 1912. Ore milled amounted to 33,169 tons, of which 31,417 tons came from the mine and 1752 tons from dumps. The mill treated an average of 113.2 tons per day of actual working time. The metal content of the ore consists of gold with a small percentage of silver. The average head value at the mill was $11.53 per ton and tailings averaged $1.17 per ton U. S. currency; the extraction was 89.84%. The following costs are reported, and apparently represent the total expenditure during the year: Development, 0.602 pesos per ton; stoping, 4.295; milling, 5.577; general and marketing, 0.532; total operating expense, 11.006 pesos. In addition to this expenditure the following amounts were expended: Mining property, 0.186 per ton; mine equipment, 0.006; mill plant, 0.662; estate, 0.577; transporting equipment, 0.377; total, including operating expenditure, 12.814 pesos per ton of ore or about $6.40 per ton. This is the first producing year for the company, and it is stated that the general conditions of the property have been improved in many respects, a suitable staff house containing living quarters for American and European employees has been constructed, and separate houses for the superintendent and a number of married American employees have also been built. A complete line of supplies for mine and mill was reported on hand. The development work consisted of 2182 ft. of drifts, etc., 575 ft. of which were timbered. Of the ore mined, 45% came from the first level and 55% from the second level. The ore from the first level averaged $13.16 per ton and the second level, $10.50 per ton. It is estimated that the ore reserves as now blocked out contain 217,215 tons of ore, averaging $10.77 per ton or a gross value of 2,388,885 pesos. A dividend of 100,000 pesos was paid on Dec. 4, 1912, on 100,000 shares, par value, 10 pesos each.

❋

Mount Morgan Gold Mining Co.

The annual report of the Mount Morgan Gold Mining Co., Mount Morgan, Queensland, for the year ended May 31, 1913, shows that 312,068 tons of ore were treated during the year, including ore from the Many Peaks mine; 9280 tons of fine copper and 126,082 oz. of gold were produced from this ore. The total revenue from all sources amounted to $5,540,539. Total expenditure was $3,591,044, which includes $606,266, payments to Queensland Government; $1,938,873 for wages and contracts, and $1,045,945 for other expenditures. The profit for the year was $1,949,495. At the Mount Morgan mine 2.72 tons of ore were broken per miner and shoveler per shift; 1.32 tons broken and delivered per shift per underground employee. The average earnings per contract miner per shift were $4.40; and per contract shoveler, $3.15 per shift. The cost of breaking ore and moving from face of stopes to chutes, including explosives, was $1.25 per ton. Of the 224,385 tons of ore hoisted from the Mount Morgan mine 575 tons came from and above the 450-ft. level; 21,187 tons from 512,-ft. level, 23,594 tons from 574-ft. level, 87,032 tons from 650-ft. level, 35,107 tons from 750-ft. level, 56,610 tons from 850-ft. level and 280 tons from and above the 1050-ft. level.

Designs were prepared for installing conveyor belts in the opencuts, to deliver mullock to the passes leading into the mine and also other conveyor belts underground for carrying the mullock through such places where hand trucking is now employed. The development work at this mine consisted of 186 ft. of drifting; 49 ft. of recessing, 399 ft. of sinking and 25 ft. of raising.

At the Many Peaks mine 2.19 long tons of ore were secured per miner per shift and 1.47 per shift per man employed underground. During the year, 1078 ft. of driving and 412 ft. of sinking were performed. The net ore reserves as reported by the company at the end of the year consisted of 1,365,000 tons of high-grade and 1,982,000 tons of medium-grade ore. The following table shows the material handled and the results at the smelting works:

	Tons	Copper obtained	Copper %	Gold oz. obtained	Gold dwt. per ton
Copper ore	203,777	6,958.15	3.41	96,851.60	9.50
Gold ore	19,895	529.71	2.66	18,831.38	18.93
Many Peaks	88,396	1,346.02	1.52	658.20	0.15
Purchased	353	40.14	11.37	95.60	5.41
Miscellaneous	9,677	406.18	4.19	2,051.09	4.24
Total	322,098	9,280.20	2.88	118,487.87	7.36

In addition to the gold shown in the table 7594.49 oz. were produced from Mundic works cleanup. The fluxes and fuels used in smelting were as follows: Limestone, 72,874 tons; ironstone, 1573 tons; and coke, 43,472 tons.

An addition to the power plant was started during the year. The boiler house will consist of large-sized units automatically fired with coal. The engine room will have the following machines: 2 turboblowers, each capable of delivering 40,000 cu.ft. of air per min. to the blast furnaces at a pressure of 5 lb. per sq.in.; one mixed pressure turboblower, capable of delivering 10,000 cu.ft. of air per min. to the converters at a pressure of 14 lb. per sq.in.; three reciprocating air compressors, delivering air to the mine and for general purposes at a pressure of 90 lb. per sq.in.; three turbo-alternator rotary-converter sets of a combined capacity of 4000 kw. The existing blower room will be used in case of emergency.

❋

Broken Hill South Silver

The report of the Broken Hill South Silver Mining Co., Broken Hill, New South Wales, for half-year ended Dec. 31, 1912, shows that two dividends, amounting to $826,200, were paid, and the year ended with net liquid assets amounting to $1,111,627. Apparently the profit for the period was $1,130,000 after allowing for depreciation and other expenses. The ore reserves were estimated to contain 3,250,000 tons of ore, and the slimes accumulated now amount to 300,000 tons. During the period covered by the report 182,000 tons of tailings were delivered to the Amalgamated Zinc, Ltd., and the Zinc Corporation, Ltd. The mine produced 178,547 tons of crude ore averaging by assay 13.7% Pb, 6.4 oz. Ag, and 13.8% Zn. Of the ore mined, 0.8% came from the 1170-ft. level, 29.6% from the 1070-ft. and 42.8% from the 970-ft. level, the remainder coming from between this level and the 425-ft. level.

Of the ore broken 96.5% came from contract stopes and 0.5% from miners in stopes on wages, the remaining 3% came from development work. All but 0.5% of this ore was handled from the stopes to shaft plats by contract; 58,571 cu.yd. of tailings and ashes were distributed in the stopes on contract for filling. The cost of purchase, handling on surface and distributing in depleted stopes was 97.3c. per cu.yd. of filling, or 31c. per ton of crude ore extracted. This compares with a cost of $1.23 per cu.yd. of filling and 35c. per ton of ore extracted during the first half of 1912. Practically the whole underground force is now on contract. The average earnings were as follows for an 8-hr. shift: Miners development, $4.54; miners stoping, $4.20; ore trammers, $3.43; waste trammers, $3.16 per shift.

Of the 1027 employees engaged for underground work 804 were in daily attendance. The average extraction of crude ore was reported at 6867 tons per week, which indicates approximately 8.55 tons of ore per week per man underground. On the surface 390 men were on the roll, while the daily attendance was 362, or about one man for every 19 tons of ore mined and treated. The general average for all men on surface and underground was about 6 tons of ore per week per man. The development work performed amounted to 5182 ft., of which 1154 ft. were underground diamond drilling. The concentrating plant treated 180,080 tons of crude ore, from which 27,238 tons of concentrates containing 18,755 tons of lead, 617,679 oz. of silver, 1695 tons of zinc was made. The recovery was 76% of the lead contents, 53.8% of silver and 6.8% of zinc contents.

The working cost, not including depreciation, office expenses, directors' fees, etc., was $4.68 per ton, made up of $2.93 per ton of ore for mining, 31c. for filling stopes, 58c. for development and 86c. for concentration. This was equivalent to $30.96 per ton of concentrates. According to a statement of water consumption 183 gal. of water were consumed per ton of crude ore concentrated.

❋

Arizona Copper Co.

The statement of the Arizona Copper Co., Clifton, Ariz., for half-year period ended Mar. 31, 1913, shows a production of 18,566,000 lb. of bessemer copper. The profit from operations, stores, rents, etc., amounted to $1,032,814.51. From this, other expenses amounting to $138,465.87 was deducted, leaving a profit of $894,348.64 from American operations. This expense was made up of: Expenses of administration at Clifton, after deducting interest received, $19,724.96; public subscriptions in Arizona, $807.22; taxes in Arizona, $97,815.78; office expenses in Edinburgh, after deducting transfer fees, $20,117.91. Revenue from holdings in other companies was $176,788.19. There were interest and income tax expenses amounting to $57,875.15 to be deducted from gross income, leaving a net earning of $1,013,261.68 for the period. A dividend of $59,610.57 was paid on "A" preference shares and preference stock, leaving a surplus for the half-year of $953,651.11. A dividend on common stock of $554,000 was declared, payable July 26. Expenses not charged to revenue amounted to $1,122,406, of this $1,085,720 was expended on the new smeltery and extensions to No. 6 concentrator. The remaining work on the smeltery consisted of making connections between the various departments, such as conveyor systems, dust flues, pipe connections, etc. The extension to the concentrator will increase its capacity to 3000 tons a day.

❋

The Batopilas Company in 1912

A preliminary report gives data, partly estimated, on the operations of the mine in 1912. The production was 702,000 pesos, with sundry profits of 25,000 pesos. Mining, milling, administration, maintenance and taxes amounted to 516,951 pesos. Bond charges were 43,980 pesos for interest and 3665 pesos for accrued premiums. The remaining estimated profit was 162,404 pesos.

Investigation of Copper Enrichment

By L. C. Graton*

SYNOPSIS—The secondary-enrichment investigation is a scientific study under the joint auspices of many important American copper companies, the Harvard mining school, and the Geophysical Laboratory of the Carnegie Institution of Washington. Its aim is to augment and systematize the knowledge of the process of downward sulphide enrichment of copper deposits, which has to a greater or less extent affected deposits from which a large part of this country's copper output is derived. The plan contemplates two years of intensive study in the mining camps and in the laboratories, followed by a report embodying results achieved.

Among the many noteworthy American contributions to the science of ore deposits in recent years, one of the greatest scientific and commercial importance, as pointed out by Professor Kemp[1], was the recognition that many rich ores of copper, especially the black sulphide, chalcocite, which give way in depth to leaner sulphide material, were the result of a natural process of concentration or enrichment by which much of the copper from an overlying but now impverished region had been added, in this "zone of enrichment," to that already present in the original or primary ore represented by the underlying leaner sulphides.

Secondary Sulphide Enrichment an Appealing Theory

This hypothesis of secondary-sulphide enrichment, gradually taking shape in the minds of several observers, assumed tangible and positive form when, about 1900, the papers of S. F. Emmons, Weed, and Van Hise gave definite expression to and adduced the support of much evidence to the ideas that had theretofore been hardly more than vague though significant and fruitful conjectures. Accepted almost immediately and universally, this hypothesis became one of the most helpful instruments to those engaged in the study of ore deposits or in the finding and development of ore. It was readily and generally accepted because of its evident consistence with and explanation of many facts of observation and because of its easy comprehension, since it is one of the very few processes of ore deposition believed to take place under such conditions of temperature and pressure as can readily be duplicated artificially.

It was markedly helpful not only because it frequently elucidated the puzzling question of extreme changes in the distribution of values, but also because it applied to so many deposits of commercial prominence. A quantitative idea of the importance of the process of secondary enrichment may be gained from the fact that in the United States alone, which now supplies considerably more than half the world's copper, about three-quarters of the output is from deposits that have been more or less affected by it.

Note—This statement of the nature and scope of this investigation is presented in consequence of numerous inquiries that have been made regarding it.

*Professor of mining geology, Harvard University.

[1]Kemp, J. F., "Secondary Enrichment in Ore Deposits of Copper," "Econ. Geol.," Vol. 1, p. 11, 1905.

Theory Applied in Modified Form to Other Metals

Hardly had this hypothesis of secondary enrichment been definitely announced for copper than it was applied in more or less modified form to other metals, especially silver. The strong hold which this idea of later sulphide deposition from descending solutions has taken upon the minds of American geologists and mining engineers may be indicated by the fact that in the last 13 years some two score articles have appeared in American literature treating of this subject primarily, in addition to numerous monographs and reports in which it is dealt with in greater or less detail in connection with other subjects.

The process is unquestionably most effective in the case of copper, and the varied mineralogy and comparative abundance of that metal combine to aid our understanding of it. In view of the common exhibition of the process, and of the great amount of attention that has been given to it, it might be expected that our knowledge of secondary enrichment would be fairly complete. Many of the basal conditions governing its operation are indeed now so well understand that mining undertakings in which the process is invloved are directed much more intelligently than before.

A survey of the literature of secondary enrichment, however, leaves one with feelings of uncertainty and disappointment, for he finds in regard to many important features of the process an appalling lack of unanimity of record and opinion. One at first assumes that various observers have described phenomena that actually differ; but from the frequent occurrence of ambiguity and of implied or actual contradictions, even within single contributions, it is necessary to conclude that as yet many matters relating to secondary enrichment have not been carefully and fully thought out and that personal opinion and viewpoint are largely involved in the writings upon the subject.

Authorities Not in Complete Accord

Thus aware that "authorities disagree," we are left uncertain whether secondary sulphide enrichment is a definite, well characterized process, or whether it is a process that inherently is variable, acting in some cases in one fashion and differently in others—whether the variations noted in the literature are real, and if so, due to differences in local influences, or whether the variations arise solely or mainly from the fact that the descriptions have been written by different observers. In the majority of general writings upon this subject, the ratio of speculation and generalization to solid fact proves disappointingly large while on the other hand in many papers describing specific occurrences the statements seem to have been made with so little regard to the systematic conceptions of the process that they cannot be interpreted intelligently or safely employed.

The relation of secondary enrichment to the water level may be cited as one of the points upon which it is well-nigh impossible to secure from the literature either concordant testimony or adequate and reasonable explanation of the wide variations described, yet surely few sub-

jects connected with secondary enrichment are of such importance.

In means of distinguishing the products of enrichment from the initial constituents of the ore, we are plainly deficient. We have little to answer to the important question why enrichment is pronounced in one deposit and perhaps absent in another seemingly as favorably conditioned. How far have we progressed during these several years in our actual knowledge of the chemistry of the process, either analytical or synthetically? Equations have been written in plenty, but many of them are rather guesses as to what may reasonably take place, stated in a plausible form, involving a small number of molecules, than the results of thorough quantitative investigation. These and other perplexities make it hardly possible to deny that our knowledge of secondary enrichment is markedly incomplete.

Scattered Observations Insufficient Evidence

Some four years ago, I attempted the preparation of an article on secondary enrichment of copper. After long effort to reconcile the literature with itself and with my own brief observations in most of the important copper camps of the country, it appeared that satisfactory treatment of this subject could not depend on scattered observations of various students, but must rest on widespread study of occurrences directed especially toward this single problem, and accomplished as nearly as possible through one pair of eyes, so that such unknown quantities as personality, experience and viewpoint would be reduced to a minimum and a constant. Professor Irving[1] has recently stated the case with much force in his plea for the special-problem type of geological investigation:

> . . . . At present we progress in our study of this subject (secondary enrichment) by each man adding here and there a little of what he has observed in the few localities which he has had opportunity to study, and increase in our knowledge is very slow. If some . . . . geologist were sent out to study this problem of secondary enrichment, now in Alaska, now in the tropics, now in a dry country and now in one of heavy rainfall, now in deposits of one metal, now in those of another, a vast array of clearly correlated geological observations could be gathered from which generalizations of incalculable value might be deduced, and deduced in a comparatively short time.

As opportunity arose, efforts were made toward consummating such a plan. The commercial importance of the problem, fortunately, made it possible to secure funds for the study and more important still, to enlist the cooperation of practically all the important American copper companies that mine ores affected to a greater or less extent by secondary enrichment.

Concerted Attack on Problems

Since this plan was conceived, there have appeared, in addition to numerous articles bearing upon the subject, systematic expositions of secondary enrichment by Dr. F. L. Ransome,[2] Prof. C. F. Tolman, Jr.,[3] and just now the elaborate and thoughtful treatise by Prof. W. H. Emmons.[4] The great value of these contributions is plainly evident. They appear to be, however, so far as field study is concerned, rather the accumulation of ideas gained more or less incidentally to the pursuit of more comprehensive objects than the results of deliberate attack upon this particular problem in the mines. Although these writings may anticipate some of the results to be expected from this detailed study, it is not to be doubted that independent corroboration of the conclusions they contain will be worth while, and it is to be hoped that, with concerted detailed examination of many occurrences, with the marked advantages afforded by the recently developed methods of opaque mineral examination, and with the assistance of thorough chemical study, conclusions may be reached concerning some of the questions now unsettled and additional matters of interest be uncovered, with the possibility that some existing views may have to be modified or abandoned. It is believed, therefore, that these recent treatises, as well as such suggestive papers as that by Winchell[5], and the earlier articles by Kemp, S. F. Emmons, Weed and others, while of great help in this study, do not lessen, but rather emphasize the need of systematizing and unifying our knowledge of secondary sulphide enrichment, and of adding to it wherever possible.

Questions Must Be Answered after Careful Study

In outlining the attack upon this problem, it has been felt that fact must be all-important, and the more or less unconscious bias due to preconceived notions must be eliminated so far as possible. The other extreme of headlong attack through the complete elimination of hypothesis or systematic outline would, if anything, be worse. In the hope of striking a happy mean a syllabus has been prepared which consists entirely of questions, the answers to which it is hoped can be gained during the study. These questions, arranged under systematic headings, are intended to cover all the ideas that have as yet been expressed regarding secondary enrichment of copper ores; they consttute an impersonal, impartial screen with which to sift out all the pertinent facts, regardless of the conclusions that may result.

The geological part of the investigation is being conducted under the auspices of the Harvard mining school, where preparatory investigations have been carried on during the last three years, and where ample laboratory facilities are provided for the study. With the idea of unifying methods and conceptions, the geological staff has been made as small as is consistent with covering the wide field in a reasonable and effective period. On the other hand, the training and experience represented are believed to be sufficiently varied to avoid falling into ruts. The staff consists of Augustus Locke, Alan M. Bateman, Joseph Murdoch and Edward H. Perry, besides myself, while C. T. Brodrick will study several European and Asiatic occurrences.

For the solution of the chemical side of the problem it was happily possible to engage the interest of the geophysical laboratory of the Carnegie Institution of Washington, where recent chemical researches of much geological significance on the sulphides of iron, zinc, and mercury afford preparation and foundation for this study of the copper sulphides. This chemical work is under the direction of E. T. Allen, assisted by J. L. Crenshaw, E. G. Zies and Eugen Posnjak, chemists, and H. E. Merwin, petrologist. Closest coöperation between the geolog-

[1] Irving, J. D., "Special Problems and Their Study in Economic Geology. "Econ. Geol.," Vol. 5, p. 676, 1910.

[2] "Criteria of Downward Sulphide Enrichment." "Econ. Geol.," Vol. 5, p. 205, 1910.

[3] "Secondary Sulphide Enrichment of Ores." "Min. and Sci. Press," Vol. 106, pp. 38, 141, 178, 1913.

[4] "The Enrichment of Sulphide Ores." U. S. Geol. Surv., "Bull. 529," 1913.

[5] Winchell, H. V., "Prospecting in the North." "Mining Magazine," Vol. 3, No. 6, pp. 436-438, 1910.

ical and the chemical staffs is to be practiced so that each may profit by the findings of the other.

Two Years to be Devoted to Study

The plans provide for a two years' study of this problem, during which time the mines of the following companies that are coöperating in this movement will be examined:

DISTRICT	COMPANY
Alaska	
Copper River Dist.	Kennecott Mines Co.
Montana	
Butte	Anaconda Copper Mining Co., East Butte Copper Mining Co., North Butte Mining Co.
Utah	
Bingham	Utah Consolidated Mining Co., Utah Copper Co.,
Tintic	Centennial-Eureka Mining Co.
Nevada	
Ely	Consolidated Copper Mines Co., Nevada Consolidated Copper Co.
Arizona	
Ajo	Cornelia Mine
Ray	Ray Consolidated Copper Co.
Miami	Inspiration Consolidated Copper Co., Miami Copper Co.
Globe	Old Dominion Copper Mining & Smelting Co., United Globe Mines
Patagonia	R.R.R. Mine
Bisbee	Calumet & Arizona Mining Co., Copper Queen Consolidated Mining Co.
Gleeson	Leonard Copper Co.
Morenci	Arizona Copper Co., Ltd., Detroit Copper Mining Co., Shannon Copper Co.
New Mexico	
Santa Rita	Chino Copper Co.
Leopold	Burro Mountain Copper Co.
Tennessee	
Ducktown	Tennessee Copper Co.
Mexico	
Cananea	Cananea Consolidated Copper Co.
Nacozari	Moctezuma Cop er Co.

It would be absurd to assume that a small field staff could in two years independently secure the main features of the geology of these districts that bear significantly upon the problem. The descriptions already exists ing of many of these camps, especially the monographic reports of the U. S. Geological Survey, will be of much assistance, particularly in regard to the more general features of the geology. It is plain, however, that the main fund of information assembled must be that gained by the geologists and engineers of the several companies who have studied the orebodies in detail day after day and year after year, who know the conditions that existed in workings now abandoned or inaccessible, and whose intimate acquaintance with the deposits will enable them to indicate the places and features of importance in connection with enrichment. The regular field staff of the investigation, then, will act as a collecting corps, seeing the occurrences that the local workers point out, recording the facts they have gathered, and finally assembling the entire data systematically so as to bring out the points of similarity and contrast. The local geologists and engineers, so far as they permit and desire, are thus virtually to be partners in the study, sharing credit and responsibility in the results.

To supervise generally the investigation and especially to foster the spirit of coöperation between the investigating staff and the copper companies, the following gentlemen have consented to act as an advisory board for the investigation: J. Parke Channing, James Douglas, D. C. Jackling, L. D. Ricketts, B. B. Thayer, Pope Yeatman.

The secondary-enrichment investigation was formally started on January first of this year with the beginning of chemical work by the geophysical laboratory in Washington. Geological field work was begun on June 15, with a preliminary examination of the Butte deposits. The study at Bingham has just been completed, and the field staff will gradually work southward, commencing in the Arizona camps at Ray. It is a pleasure to record with appreciation the satisfaction and encouragement given the members of the field party by the earnest and helpful coöperation and the personal courtesies extended by officials of the mines thus far visited. At the close of the study the combined results will be assembled and published as a comprehensive report on the secondary enrichment of copper deposits, together with such information as may have gained regarding the behavior of other elements under the conditions of enrichment.

Chronology of Mining for October

Oct. 1—Butte, Anaconda & Pacific Ry. began operating regularly with electric power.—John C. Branner inaugurated president of Stanford University.

Oct. 2—First ore from South Cuyuna range, Minnesota, shipped from Barrows mine.—Hearings resumed in suit of Government against U. S. Steel Corporation.—Rudolf Weniger, assistant superintendent of mines for the Cia. Minera de Peñoles, killed near Mapimi, Mexico; mines and reduction works subsequently closed down and foreigners left the region.

Oct. 5—Nome, Alaska, almost totally destroyed by storm.—Commonwealth mill at Pearce, Ariz., commenced operations.

Oct. 10—Washoe smelting works resumed operations after two weeks' general cleanup.

Oct. 14—Colliery explosion near Cardiff, Wales; 417 men killed.—Colliery explosion in south of France.

Oct. 17—Strike of miners at Rio Tinto, Spain, closed the mines.

Oct. 20—American Mining Congress at Philadelphia.

Oct. 21—Lake Superior striking copper miners began attempts to wreck trains bringing in strikebreakers.

Oct. 22—Colliery explosion at Dawson, N. M.; 261 men killed.

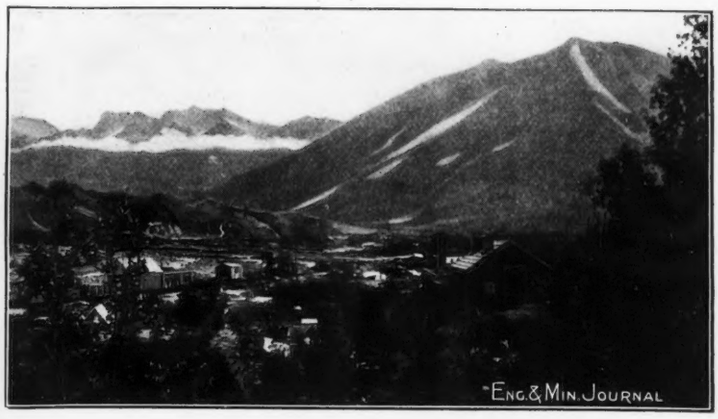
Bauxite Brick

According to Kenneth Seaver, in a paper published in the "Proceedings Engineers' Society of Western Pennsylvania," July, 1913, the crude bauxite utilized for brick making is exceedingly variable in composition, and great care must be exercised in its selection, in order to maintain uniformity of product. The principal sources of domestic supply are Arkansas, Georgia, Alabama and Tennessee, in the order named, and the range of composition is about as follows: Fe_2O_3, 3 to 6; Al_2O_3, 55 to 60; SiO_2, 4 to 7; TiO_2, 2 to 2.75; water of crystallization, 30; moisture, 1.50 per cent.

The crude material must be thoroughly calcined at high temperature to expel all water of crystallization; suitable bonding clays are then added, and the brick burned at the highest temperature of the kilns. The early difficulties in the use of bauxite brick occurred partly through unsuitable bonding materials, partly to insufficient calcination of the crude material, and partly to incomplete burning in the kiln. A high-grade brick should contain about 56% Al_2O_3, a representative analysis being as follows: SiO_2, 38.38%; Al_2O_3, 56.77; Fe_2O_3, 2.95; CaO, none; MgO, 1.09; alkalies, 0.88%. Brick containing a still higher percentage of alumina can be made, if desired. The name bauxite brick is very loosely applied, and some specimens contain as little as 43 to 51%. A properly made brick is strong and tough, but has a tendency to spall if suddenly cooled or heated.

PHOTOGRAPHS FROM THE FIELD

HAMSHAW OPERATIONS ON BONANZA CREEK



McCARTHY, ON THE COPPER RIVER & NORTHWESTERN RY.

CROSSING THE NIZINA RIVER

NO. 1 ABOVE DISCOVERY LITTLE ELDORADO CREEK

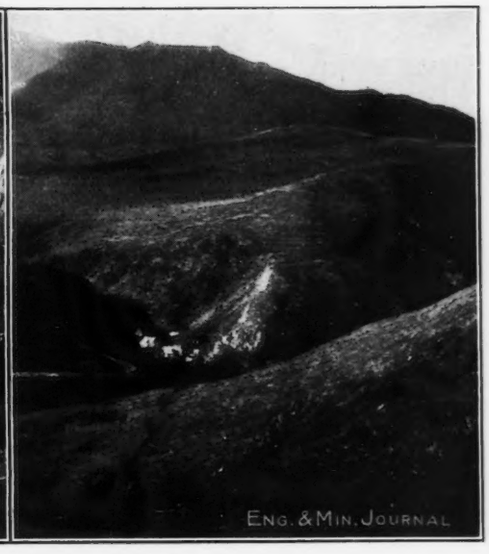
THE SHUSHANNA OR CHISANA DISCOVERY WAS AN IMPORTANT EVENT IN ALASKA IN 1913

William James and Andy Taylor discovered gold in Eldorado Creek early this year and in the crude sluice shown on the opposite page made a good cleanup late in the season. The discovery was made 100 miles northwest of McCarthy on the Copper River & Northwestern Ry. It is reported that 12 men have lost their lives in attempting to cross the Nizina in the rush to the new diggings.

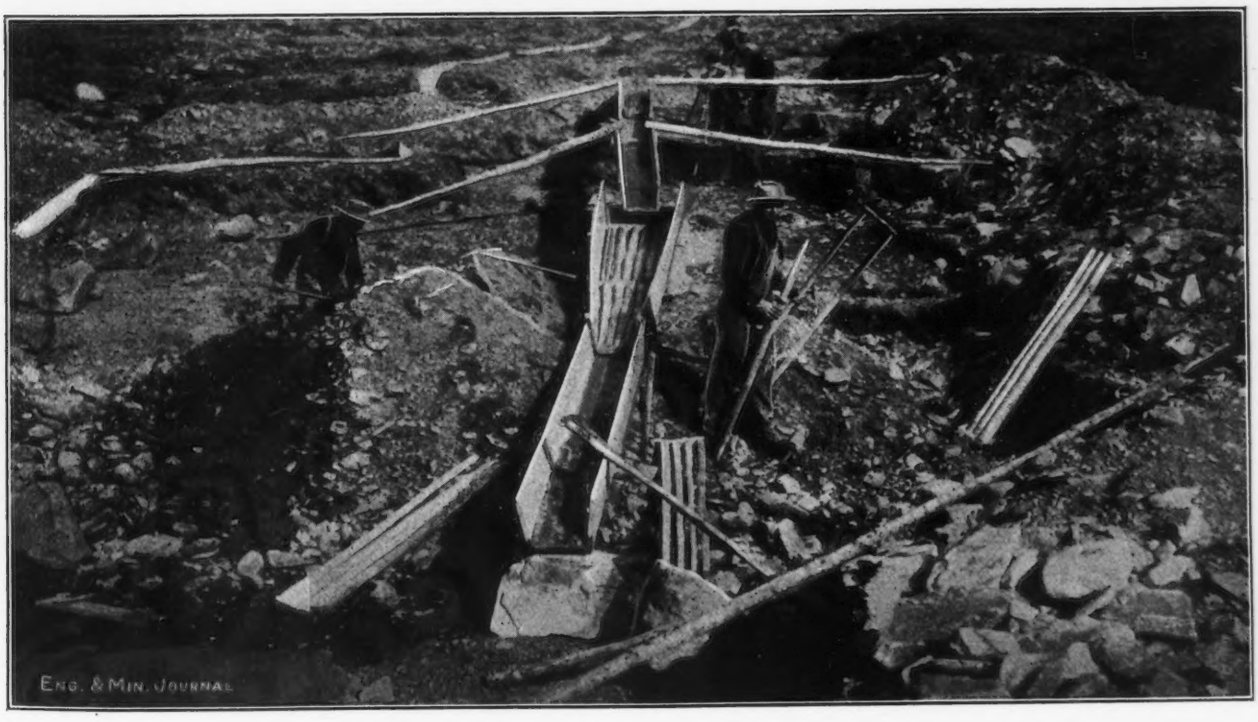
A Typical Mining Town in Yukon Territory

Deposit of Volcanic Ash on the Yukon

Junction of Eldorado with Snow Gulch



James' Camp on Eldorado Creek



James Discovery on Eldorado and Sluice in Which $40,000 Was Recovered

Metal Mines Production in California, in 1912

The gold, silver, copper, lead and zinc production in California in 1912, as reported by the U. S. Geological Survey, aggregated $26,383,946, an increase of $1,209,269 over 1911. The gain was due chiefly to the increased yield from deep gold mines, increased value of copper and silver and increased production of zinc. The greatest gain was in the advance in the commercial value of copper. The quantity of copper produced was less than in 1911. The mine production of gold is placed at $19,713,478, a decrease of $25,430 from 1911. The production of silver was 1,300,136 fine ounces, an increase of 29,691 oz.; copper, 33,451,672 lb., a decrease of 2,864,464 lb.; lead, 1,144,731 lb., a decrease of 253,380 lb.; zinc, 4,345,591 lb., an increase of 1,538,556 pounds.

The leading gold-producing counties in the year and the values produced by each were: Amador, $2,796,194; Luba, $2,753,408; Butte, $2,346,229; Nevada, $2,081,958; Sacramento, $1,712,587; Tuolumne, $1,113,291.

There were 1041 metal-mining properties reported productive in 1912, of which 532 were deep mines and 509 placers of various kinds. This shows a total decrease of 140 producing mines in 1912. There were 470 deep gold mines, 12 silver, 24 copper, 25 silver-lead-zinc and one zinc. Of the placer producers, 141 were hydraulic mines, 65 dredges, 146 drift and 157 surface or sluicing mines. There were 64 less deep and 76 less placers producing in 1912 than in 1911. The deep mines of California produced 2,641,497 tons of ore in 1912, a decrease of 155,764 tons. Of this output 2,225,429 tons were siliceous ore, 408,622 tons copper ore, 974 tons lead ore and 6472 tons zinc ore. The siliceous-ore output decreased 70,918 tons, the copper ore decreased 85,659 tons, the lead ore decreased 1034 tons and the zinc ore increased 1847 tons.

The total average value from all ore sold or treated in California in 1912 was $6.71 a ton, against $5.49 a ton in 1911 and $6.71 a ton in 1910. At gold and silver mills in California in 1912 the tonnage milled was 2,077,300 tons, yielding $10,371,347 in gold and 307,306 oz. of silver, valued at $188,993, or an average value in gold and silver of $5.08 a ton, compared with $4.64 in 1911 and $5.25 in 1910. Of this average value $4.17 was recovered as bullion in batteries and on plates in mills.

The smelting ores, 456,735 tons, produced all the copper and zinc, and practically all the lead, as well as 955,067 fine ounces of silver valued at $587,366, and $592,532 in gold. There were also treated 107,462 tons of old tailings, yielding $103,936 in gold, an average of 96c. a ton, and $1298 in silver, an average of 1c. a ton.

The placers of California in 1912 yielded $8,645,663 in gold and 35,652 oz. of silver, valued at $21,926, a decrease of $339,895 from the placer output of 1911. The hydraulic mines showed an increase of gold output of $14,196, the dredges a decrease of $236,506, the drift mines a decrease of $91,908, and the surface placers a decrease of $26,646 in gold. The placers produced 43.86% of the total gold yield of the state and the deep mines 56.14%. The dredges produced 37.68% of the entire output of gold in the state in 1912 and 85.93% of the placer gold.

The total gold-dredge output of California from 1899, when only $206,302 was produced, has been $55,415,191, including the $7,429,951 obtained from this source in 1912.

The Federal Mining & Smelting Meeting

The New York *Times* gives the following account of the recent meeting of the Federal Mining & Smelting Co., which was of interest from the standpoint of the human factor:

The meeting was enlivened by the presence of Sidney Norman, who has a suit pending for the cancellation of the contract by which its output goes to the American Smelting & Refining Co.; ex-State Senator A. M. Strode, of Mullan, Idaho, who described himself as "an old sagebrusher," and a number of small stockholders who occasionally interrupted the vigorous declamations of these two to say plaintively that all they wanted to know was why they hadn't received any dividends for several years.

Mr. Strode said that Mr. Norman's suit "had no charms" for him, and it was local conditions out in Idaho that he wanted changed, so that Francis H. Brownell, of Seattle, chairman of the board, who was the only representative of the management present except Frank Sweeny, the secretary, had three distinct elements of opposition to deal with. Mr. Brownell proved fully equal to the task, stood the heckling for three hours, and answered every question with apparent candor and good temper except that he would not go into matters that were involved in the company's defense to the Norman suit.

The protagonist in what Mr. Brownell jocularly called "the bear fight" was Mr. Strode, who had submitted in advance 14 questions that he wanted answered by the directors. During the discussion, which was good-natured throughout, it developed that Mr. Strode had failed of reëlection last year, and that he had been charged with owning four saloons in Mullan, which, it seems, is a crime in Idaho. The law prohibits the ownership of more than one by the same man. Mr. Strode denied that he had any interest in even one saloon, and said he didn't want to be reëlected, as in order to be he would have had to make two or three concessions to the Federal Mining people, which he was unwilling to do.

The town of Mullan, whose unexpurgated population estimate is 1800, is apparently as well equipped with hotels as with saloons, as during the discussion of the boarding houses and stores maintained by the United Stores Co. Mr. Sweeny declared there were 15 hotels where the miners could board if they didn't like the boarding houses. Forgetting local pride, Mr. Strode contested this and Mr. Sweeny agreed to furnish him with a list of the "hotels."

The local conditions that Mr. Strode wanted straightened out concerned the practice of the company of deducting from payment to the miners money they owed to the United Stores Co. for board or supplies, the company's part ownership in a losing newspaper, the inclusion of ore from the newly acquired Greenhill-Cleveland mine under the contract with the American Smelting & Refining Co., and a variety of minor matters, on some of which he was satisfied by Mr. Brownell's explanations.

Mr. Brownell said that money for the United Stores Co. was deducted only when orders were given by the men, and that there was no pressure on them to do business with the United. He denied that men had been discharged for trading elsewhere, and said that no executive officer of the Federal company had any interest in the United.

"Frank Sweeny here owns 10 shares in the stores company, according to its books," retorted Mr. Strode.

Mr. Sweeny didn't know whether he owned the shares or not.

"If the books show it, I own it," he said, and Mr. Brownell added that in any case Mr. Sweeny was connected merely with the New York office.

"The fact is," pursued Mr. Strode, "that man after man has been discharged because he left the United boarding house."

"That is not true," said Mr. Brownell.

"If you have no interest in the stores company," asked Mr. Norman, "why do you deduct their bills from the wages"?

"We will do that for anybody that gets an order from the men," replied Mr. Brownell. "In the early days the mines in the Cœur d'Alene found great difficulty in obtaining accommodations for the men in the way of boarding houses and stores, and every mine had to provide them. The mines for-

merly owned an interest in the stores, which was abolished when the Federal was started. The company has to see that there are proper accommodations or it can't get the men. It also has to see that the men get credit, so that they can get the equipment needed to go to work. It is thus necessary for the company to protect the boarding houses and the stores, and that is the only relation that now exists between the Federal and the United."

"What difference does all this make to us"? inquired a bored stockholder. "We are not interested in the troubles of the miners, if they have any. They can take care of themselves. What about our dividends"?

"If a new store was started," went on Mr. Strode, "would you guarantee to give it the same treatment, and if a man was discharged for patronizing it to investigate the matter"?

"Certainly," replied Mr. Brownell, and Mr. Strode insisted on shaking hands on this promise.

"That's all I came to get," he declared when this solemnity had been performed. "I'm ready to go home."

"I would like to have something develop," mildly remarked W. P. Fisher, "to benefit the other stockholders."

"The management," said Mr. Brownell, "has been perplexed to know why Mr. Norman brought his suit. He was not one of the old stockholders, but bought a small interes last summer. We don't understand what brought him, knowing the conditions, into the company."

"That's what we'd all like to know," said Mr. Fisher.

"I didn't buy knowing the conditions," replied Mr. Norman, "and as to being a small stockholder, I own 40 times as much stock as you do, Mr. Brownell, or Secretary Sweeny or any of nine other directors. I own twice as much as all the directors put together. And I own mine, and it is not stamped across the face 'dividends payable to the American Smelters Securities Co.' as yours is."

"That's right," said Mr. Brownell, with a smile.

"I also represent 100 other stockholders," added Mr. Norman.

"The management," said Mr. Brownell, "has not felt satisfied of Mr. Norman's disinterestedness. The facts will all be brought out at the trial of his suit, but meanwhile, I don't care to make any statement except that the present management found this contract in existence, and it is a legal contract. If it is unfair the directors have no power to change it.

"I would like to know," he said, clapping Mr. Norman on the back and putting his arm around him, "who our friend Norman represents. He is not representing Mr. Norman. I understand that he has collected $20,000 or $30,000 from stockholders for the purposes of his suit."

"That is absolutely untrue," said Mr. Norman. "Your informant is a liar."

"You don't represent any ulterior interest"? queried Mr. Fisher.

"Absolutely not," said Mr. Norman. "Mr. Brownell thinks I am working for the International Smelting & Refining Co., but if he will get this contract properly revised I will sign up on behalf of myself and the other 100 stockholders I represent to continue it for the 17 years it still has to run."

"I represent 10 stockholders, and I'll join in that," said Mr. Strode.

Mr. Brownell never finished reading Mr. Strode's 14 questions, but the general discussion seemed to have covered all the ground necessary, and everybody was willing to adjourn.

Huge Capper to Be Used on Burning Oil Well

By L. M. Edholm*

Finding it impossible to put out the oil-well fire of the Kern Trading & Oil Co., by steam, as is done in most cases, the officials are now planning a huge capper to be installed 25 ft. in the earth, or if this fails, to collapse the big pipe by dynamite.

Since the coming in of this well it has been at no time less than 100 ft. across, which makes it almost impossible to ascertain just where the center of the fire is. So the capper method is to be tried by digging a tunnel into the side of the mountain to the pipe. This method was used in a previous fire among the oil wells to stop the oil flow after a fire had been extinguished. Steam, however, will be at hand in case of need when the capper is installed.

*4624 Figueroa St., Los Angeles, Calif.

Goldfield Consolidated

Report of Goldfield Consolidated for September, 1913, shows a total production of 27,979 tons. From this material $177,875 was realized.

Development cost $4.53 per ft. and 2985 ft. were accomplished.

	Per Ton of Ore Handled		
Mining:	Mining	Milling and Transportation	Total
Stoping	2.79	....	2.79
Development	0.48	....	3.27
Shipping expense	0.20	....	0.20
Dump moving	0.12	....	0.12
Transportation	....	0.09	0.09
Milling	....	1.87	1.87
Marketing	....	0.07	0.07
General expense	0.26	0.05	0.33
Bullion tax	0.21	....	0.21
Construction	....	....	....
Flood damage	0.12	0.02	0.14
Total costs	4.20	2.10	6.30
Miscellaneous earnings	0.08	0.04	0.12
Net costs	4.12	2.06	6.18

Asbestos-Protected Steel

A new construction material, asbestos-covered steel, is described in the Asbestos Protected Metal Co.'s Bull. No. 16. The Duckback brand, for exterior use, is composed of a steel sheet, of U. S. Standard gage, 18, 20, 22, 24 or 26, coated on both sides, with one or two layers of asphalt, applied hot, on which is compressed a layer of long-fiber asbestos, in gray or terra cotta colors. The sheets are either flat, corrugated or beaded, and are attached to the roof structure in the same manner as black or galvanized plates. Their weights range from 125 to 225 lbs. per 100 sq.ft. The price of 22-gage metal is $11.50 per 100 pounds. The asbestos will take and hold paint, if desired, but this is not necessary for the preservation of the material, one of its recommendations being that the cost of maintenance is practically eliminated. The material has been proved under the most severe use, as roofing and siding for acid factories, steel plants, coal-mine installations, and fertilizer factories near the seacoast. About 400,000 sq.ft. of this material were recently used in covering a modern zinc-smelting works.

Condoriaco Cyanide Plant

The mill and cyanide plant of the Sociedad Beneficiadora de Condoriaco, Ltd., have recently been sold to Mark R. Lamb. The intention when the plant was built was to treat an 80,000-ton dump of $10. gold-silver ore, but no start has been made on it, as sufficient custom ore has been offered to keep the mill busy. The plant is at Condoriaco, 30 miles from the nearest railway, in a district which has a record of large production. It is being increased in capacity, and modern luxuries, such as Dorr apparatus and vacuum filter, are to be added.

This is the first operating cyanide plant in Chile, and the only one now operating, though two small ones for Las Vacas and Taltal will be running this month. The Vacas plant will treat gold ore and the Taltal is for silver. The first is owned by a Chilean company and is under Chilean management, while the second is under an American cyanider.

CORRESPONDENCE AND DISCUSSION

Dewatering Huntington Mill Feed

In an article entitled "Huntington Mills and Their Operation," published in the JOURNAL of Aug. 2, Mr. Rice recommends dewatering the feed to a Huntington mill if it is used to regrind table or jig tailings in concentrating practice. It is possible that at the Silver King mill, by adopting this scheme, the cost of maintenance of Huntington mills has been reduced, but if a fine discharge screen, say, 30 to 40 mesh, is used, a fair amount of water is needed inside the mill to prevent the screens from blinding. I have tried time and again to use less water in the feed, because it not only would reduce the wear on the mill, but also because a finer and more uniform grinding would result. But after a short time the screens would blind to such an extent, that the mill choked, and spilled the pulp over the sides, unless a man was employed all the time cleaning the screens with a steel-wire brush.

As far as the ordinary cast-iron shoe for truing up the ring die is concerned, I can easily understand that it finds little favor with mill men. I use only shoes of hard cast steel with good results. By regularly using the grinding shoe in every mill twice a week for eight hours, the dies are preserved in good condition. I was once obliged to use shoes of softer material, but it only resulted in a rapid wear of the shoe, and the ring die remained just as uneven as it had been.

M. G. F. SÖHNLEIN.

Machacamarca, Bolivia, Sept. 8, 1913.

New York's Mining Law

I have read with interest the editorial in the JOURNAL of Sept. 20, discussing the proposed new mining laws for New York State, and agree with you that the matter is being hurried along too much. Such, also, is the sentiment of local mining men with whom I have talked. The point that New York's mineral industry is more important than is commonly supposed is well taken, and I would emphasize the fact that New York and New Jersey combined, with an area of 55,000 square miles, make annually an output of mineral products exceeding in tonnage and value that of California with an area of 155,000 square miles. Furthermore, New York's mineral industries are of a much more varied nature than those of the ordinary western state, including well established businesses in salt, gypsum, talc, graphite, iron ore, petroleum, etc.

On account of the miscellaneous character of New York's mineral products, it is difficult to standardize a mining code which shall suit all conditions fairly, although, as pointed out in the editorial, New York has had for a long time a general law governing mining conditions. Since it is now proposed to enact a new code for the safeguarding of employees in mines and quarries, it does not, on the face of it, look well to have an industrial board composed of four gentlemen and a lady, no one of whom is known ever to have been in a mine.

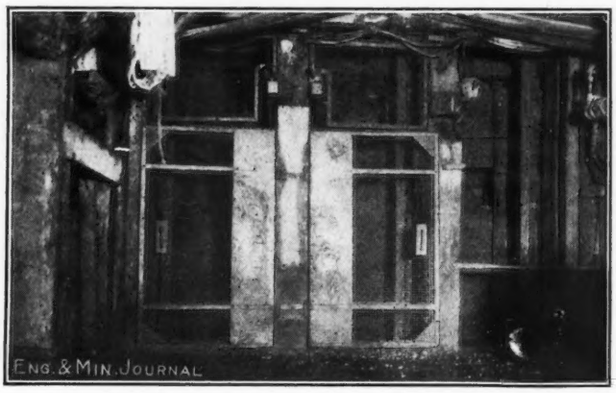
P. B. MCDONALD.

Gouverneur, N. Y., Sept. 22, 1913.

Speculator Shaft Accident

The criticism of the care taken of the hoisting shaft at the Speculator mine, in the JOURNAL of Oct. 11, 1913, under "By the Way," is unjust to the men who have charge of this work. A second thought will show that the system in vogue of not cleaning the shaft timbers is the common-sense and safest way.

In hoisting with skips loading direct from large ore pockets, even with the most approved ore chutes with air-operated gates, some pieces of ore will drop down the shaft. Again at times the skips may be overloaded and ore drop off the skip in its ascent up the shaft. This being a recognized possibility, it is much better to have the shaft timbers well covered with fine ore, which naturally takes the angle of repose and gives no chance for pieces large enough to do any damage to lodge on the timbers. The danger is not from rocks lodging on timbers that are covered with ore, but from rocks lodging on new timbers that may have been put in in repairing the shaft and which have not had time to be covered with fine ore. The fine ore on the timbers is packed hard by the continual pounding of ore falling in the shaft and not only protects the timbers from wear but is considered much safer than having a ledge a foot wide all around the shaft every five feet for a distance of 2800 ft., on which large pieces of ore would accumulate and be a continual menace to men in the shaft.



2600 LEVEL, SPECULATOR SHAFT, BUTTE, MONT.

An examination of the shaft by the shaft men after the accident in question did not reveal any place on the shaft timbers where a rock could have lodged. The rock which caused the accident was a fresh piece of ore, which was probably pushed into the shaft from one of the upper levels where the station dumpers were cleaning the landings, which is done when each shift goes on. This, however, is merely a supposition.

At the Speculator mine of the North Butte Mining Co., the shaft is carefully inspected every day by men receiving shaft-bosses' wages, one pair of men to each compartment of the shaft.

Inclosed you will find a photograph of the 2600 station, showing the wire doors in front of the two hoisting compartments. As the third compartment is lagged off from the others, it is not considered necessary to protect it in the same way as no ore is hoisted through it.

N. H. EMMONS.

Butte, Mont., Oct. 24, 1913.

The Use of Bucket Crossheads

An editorial was published in the JOURNAL of Oct. 11, regarding the use of bucket crossheads. It is true that in a great many mines, especially in Colorado, it is deemed bad practice to use the crosshead in connection with a bucket in a vertical shaft. I think, however, that if a safety crosshead were used, this prejudice would be overcome.

The majority of the crossheads that are used at the present time are entirely inadequate, and are a menace to the miners who come in contact with them. A few years ago, Thomas Bryant, who, at the time, was in charge of a property in Montana, had a sad experience with the old type of crosshead, caused by its sticking in the shaft, allowing the bucket to be lowered away from the crosshead for quite a distance. After the bucket had left the crosshead, the crosshead came loose and fell down the shaft, killing Bryant's brother, as well as another miner who was on the bucket at the time.

To avoid the repetition of such occurrence, he devised a crosshead which has since been installed in some of the largest mines in the West, among which are the Original Consolidated Mining Co., at Butte, the Giroux mines, at Ely, the East Butte Copper Mining Co., at Butte, the Corbin Alta Mining Co., at Corbin, and others.

The Bryant safety crosshead was described in the JOURNAL of April 15, 1911, and in the "Handbook of Mining Details," p. 280.

This crosshead is so built that there is eliminated any chance for accident by the falling of the crosshead upon the bucket. The cable is always free to move independently of the crosshead, and if the crosshead should get caught, no delay is occasioned, as the bucket can be lowered as far as desired, and when raised again, the crosshead will be automatically released. This crosshead is especially adapted for use in the shaft sinking, where it is necessary to lower the bucket below the end of the guides, as stops can be placed at the ends of the guides which will operate the safety mechanism on the crosshead, thereby securely holding it in place.

The mining inspector for the State of Montana, William Walsh, in his annual report to the governor of the State of Montana, for the year 1909, had the following to say as to the merits of the Bryant crosshead.

> Hoisting apparatus in mines, such as crossheads, skips and cages, have always been recognized as having an inherent element of danger, and many efforts have been put forth to provide various means of safety. Readers will doubtless recall the many accidents which have happened in the state and the number of lives lost by crossheads being used in shafts without any means of safety. Thomas Bryant, of Butte, has invented what is known as the safety crosshead, which has been tested and proved a success in every particular. The first distinctive feature of this combination is the safety catch, which grapples the guides and prevents the crosshead from falling away. Another feature is a safety beneath which grapples the bucket in the event the rope should break, everything working in uniformity, holding the crosshead and bucket safely in the shaft, thus eliminating all danger. In shaft sinking and operating in small mines, where buckets are in use 300 ft. and deeper, the miners of this state should see that a law be enacted so as to compel their use in all shallow mines and in shaft sinking. The state must realize that when the miners are underground they have rights of person which it is obliged to protect, and it should give due regard to the safe-guarding of the lives and persons of mine employees.

Mr. Walsh's statements are corroborated by William B. Orem, deputy mining inspector for the State of Montana, who, in his annual report for the year 1909, wrote in regard to these crossheads as follows:

> The crosshead invented by Mr. Bryant is a great improvement over the common crosshead used in this camp for years, being the cause of several accidents by hanging up when the miners were riding on the bucket, not noticing it, then coming loose, falling and catching them. The one invented by Mr. Bryant does away with the danger of hanging up, and in the case of the rope breaking it holds not only the crosshead, but the bucket as well. It also gives the same freedom to the bucket at the bottom of the shaft as was had by the ordinary crosshead, by releasing the bucket at the hang-up and permitting it to go to the bottom of the shaft. This crosshead is constructed on the lines of a skeleton cage, with safety dogs on it, bonnet and deck for men to ride on. The safety dogs are operated from the bottom by a hollow pipe which allows the rope to pass through. I do not consider the common crosshead safe and recommend the new safety crosshead to any operators using crossheads for sinking.

I hope these remarks will bring forth further discussion of this subject.

W. J. ROBERTS.

New York, N. Y., Oct 17.

Origin of Chalcocite

Apropos of the article, "Origin of the Butte Chalcocite," in the JOURNAL of Sept. 6, regarding the character and genesis of the Butte chalcocite, which the author describes as a primary mineral, I consider it not inopportune here to state that precisely similar occurrences are to be found in other parts of the United States. As an example, in the Lee shaft of the Ruby Copper Co., in Santa Rita Mountains, about 10 miles north of Patagonia in Santa Cruz County, Arizona, there is an occurence of massive chalcocite which cannot be other than primary. Although this body of ore occurs at a depth of 360 ft., the shaft is practically dry, regardless of the fact that on the Hosey property to the north and the Happy Jack to the south, there are shafts in both cases filled to the collar with water, and the further fact that both of these properties are on higher ground than the Lee. In the vicinity of the Lee, the sheet of porphyry which covered the district in the late Tertiary has been almost completely worn away, leaving exposed a thick series of metamorphosed sediments. Immediately below these comes a thick deposit of fine-grained, black, sedimentary rock, no doubt formed by the compression of the accumulated, fine-grained sediment which settled farthest out from the mouth of a river which emptied here from the north in Paleozoic time. This rock is fine grained, black and crystalline, and contains scattered particles of chalcopyrite. It showed no evidence, whatever, of crushing or shearing in any part, so there was no chance for the descent of re-enriching solutions from above. The ore is high grade, much of it yielding upon assay as high as 27% copper and 100

oz. silver per ton. Here and there throughout the deposits, kidneys or globular masses of high-grade chalcocite mixed with bornite occur, the entire mass surrounded by a thick skin of almost insoluble gouge.

The character of the deposit had been a good deal of a puzzle to the manager, C. A. Pearce, who had frequently discussed it with me. Finally, after a careful examination of the deposit, we failed utterly to find any evidence tending to show that any surface enrichment had taken place.

In my opinion, the orebodies here have displaced quartzite dikes which were intruded through the old land surface long before these lava flows occured. While Mr. Pearce does not as yet fully concur in this view, he admits that the evidence so far is strongly in favor of it, and if such should turn out to be the case, the future of this property at least is assured.

A. P. MacCallum.

Benson, Ariz., Sept. 28, 1913.

A New Field in British Columbia

Owing to the closure of the field for mining investment in Mexico, it might interest JOURNAL readers to hear something about an important district in a temperate climate which has remained a "sealed book" up to the present, through lack of railroad communication, but which will be accessible in 1914 by the completion of a line that will bring it within 250 miles of large custom smelters. I refer to the East Kootenay district of British Columbia near the source of the Columbia River.

Those who have spent their lives mining in the Rocky Mountains and the Mexican Sierras will understand the mineralization in the ranges that bound this valley, when I refer to it as the great lead-silver zone on the western side of the Rockies, which continues through the United States and Mexico to the interior of Guatemala and Honduras.

Where railroad connections have lowered the transportation charges in Southeast Kootenay, large mines have been opened, and by naming a few, such as the St. Eugene, North Star, and Sullivan, in Canada, with the Cœur d'Alene district in the United States, that follow this lead-silver zone, the possibilities of the hundreds of prospects along this new railroad can be regarded most favorably.

The various surface workings, where assessment work has been done, invariably show high-grade ores, the average silver content being 1 oz. per unit of lead; but with the exception of one mine which was developed several years ago when railroad rumors were rife, no real mining has been done. About 2000 tons were shipped from it under great difficulties and expense, but the mine, which is said to have in sight over $2,000,000 in high-grade carbonate ore, has been closed down for the reasons mentioned.

One great advantage of this region is the fact that since the Canadian mining boom of the '90s, its mineral deposits have not been advertised, so that bogus companies have not given it a bad reputation, and the old-timers who have held on to their favorite claims for a dozen years or more, are only too ready to take a share in the development of their property.

Some may be mistaken in their opinion of their holdings, but their readiness to show a stranger over other properties in which they hold absolutely no interest, is a sign of the good old-time frankness which is becoming so scarce in the better-known camps.

The geological structure consists of pre-Cambrian and Cambrian schists, quartzites, dolomites and slates, with granitic or porphyritic intrusions as the main cause of the fissure veins and contact deposits. The ore occurs as massive galena in schists and slates, and as galena and cerrussite in siderite gangue when in limestone, the latter ore affording an excellent flux for any smeltery that might be built in the district.

Further to the west, deposits of copper and zinc ores are more prevalent, but owing to difficulty of access, they may be classed as unworkable for the present. Along the same zone veins of quartz and arsenical pyrites with fair gold contents are also found, but the transportation problem also applies to them.

A few more points in favor of this new district should not be omitted, these being the abundant lumber supply and water power in the vicinity of the mines. Also the slight snowfall in this valley, owing to its situation in the dry belt, compares favorably with the winter conditions nearer the coast.

As I own no property in British Columbia and am only here to take a rest from the present mining difficulties in Mexico, this is not intended to boost any particular mine; but a little information may not be amiss to a number of old acquaintances in Mexico, who, like myself, may be seeking "pastures new."

PLOMOSO.

Invermere, B. C., Oct., 1, 1913.

Why a Copper Country Miner Left Butte

In answer to William Lakeland's article in the JOURNAL of Sept. 13, 1913, "What the Union has Done for Butte," the following incident is worthy of consideration.

A Cornish miner of Calumet left the copper country two days after the strike started and went direct to Butte. He had heard so much about higher wages and good times in the great Montana mining district, that he determined to make that town his home. His wife and family went with him.

This man and his family will reside in Calumet in the future. They returned a few weeks ago. The wife explained that while they were in Butte they lived in a three-room apartment, in a basement. The rent for this unsatisfactory excuse for a house was $11.75 per month. While they resided in Calumet they lived in a comfortable company cottage of five rooms. The monthly rental was $5, less than half the amount paid for the three basement rooms in Butte. The house similar to the one they rented in Calumet for $5 per month might have been secured in Butte for $20, not less than that.

This same Cornishman explained that the price of coal was $18.50 per ton in Butte and slab wood cost $8.50 per cord. Pillsbury's flour sold in the copper country of Michigan for $2.70 per sack is sold for $3.75 in Butte. These are a few of the items, mentioned by this disillusioned Calumet miner. He made many other comparisons of a similar nature.

HOMER A. GUCK.

Houghton, Mich., Sept. 20, 1913.

EDITORIALS

The Secondary Enrichment Investigation

The article by Prof. Graton, Chief of the Secondary Enrichment Investigation, which appears elsewhere in this issue, is of particular interest, both as an authoritative statement of the organization and purposes of this important commission, and also for its disclosure of the trend of thought of leading economic geologists in a matter that is of superlative consequence in the mining industry. It is quite unnecessary for us to repeat anything that Professor Graton has said in his article. It is left for us, however, to say some things from which Professor Graton has refrained, out of his modesty; and also to express our high appreciation of the public spirit which has led the important copper producers of America to unite and render possible this important scientific research.

The Secondary Enrichment Investigation is a scientific study conducted under the joint auspices of American copper companies, the Harvard Mining School, and the Geophysical Laboratory of the Carnegie Institution as Washington. Its headquarters are in the Geological Museum at Cambridge, Mass. The advisory board comprises J. Parke Channing, James Douglas, D. C. Jackling, L. D. Ricketts, B. B. Thayer, and Pope Yeatman, whose names are a sufficient exhibition of the part that the copper companies are playing in the matter. They represent the leading copper producers of America, outside of the Lake Superior region. These companies for some years back have been promoting the development of their affairs, and incidentally of the industry as a whole, by exchanging information respecting their technical work, all former foolish ideas of rivalry, jealousy, and secretiveness, long ago having been abandoned.

The new spirit has perhaps come in with the advent of the younger generation of leaders, though, of course, the honor of being the leading exponent, the prophet of this policy, will forever be accorded to Dr. Douglas. Heretofore, however, such exchange of information has been informal. The Secondary Enrichment Investigation is the first important coöperative effort among the mining companies. It is not only important on that account, but also on account of its own intrinsic character. It is perhaps the most important geologic undertaking in progress otherwise than under state or governmental direction. Many persons will no doubt say that it is more important than any of the official work that is going on.

The composition of the investigating staff of the Secondary Enrichment Investigation affords ample ability to handle all sides of the problem with which it is engaged. Professor Graton, the chief, was formerly a member of the staff of the U. S. Geological Survey, and is now Secretary of the Copper Producers' Association, and professor of mining geology in Harvard University. His scientific work, of distinctly original character, has given him a high position among mining geologists. His assistants, Dr. Augustus Locke, Dr. A. M. Bateman, and Messrs. Joseph Murdock, E. H. Perry, and C. T. Brodrick, are all mining geologists of extensive experience in the field, each of them having been engaged in important work, generally in behalf of well known mining companies. Of the chemical and petrological staff, Dr. Alien is the chief chemist of the Geophysical Laboratory at Wasington, and Drs. Crenshaw, Zies, Posnjak, and Merwin are members of the staff at that organization.

Professor Graton, in his article, has fully outlined the plans and scope of the investigation. Without doubt, mining engineers and mining operators everywhere will generously afford assistance and coöperation. The scientific results of the investigation will surely be of great value to everybody. Perhaps after all, however, the most important thing about the present investigation is the precedent that it will constitute, which may lead to other joint researches of equally essential nature.

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The Hydrometallurgy of Copper

The New York Section of the Mining and Metallurgical Society of America had a noteworthy meeting on Oct. 23, at which the subject of discussion was the hydrometallurgy of copper. This subject is one of the great metallurgical problems of the day, perhaps the greatest. The meeting was attended by many distinguished metallurgists, including a number of those who are doing the most important experimental work in copper leaching, and there was never a technical meeting with more lively, more interesting and more illuminating discussion.

Nobody attempted to summarize the discussion or to draw any conclusions, but there were some points which stood out prominently in all the talk. These were, we think, the general use of sulphuric acid as the leaching agent, the ability to obtain a remarkably high percentage of the copper in solution in the case of a rather wide variety of ores (including the porphyry ore of Miami, Ariz., the low-grade ore of Bisbee, Ariz., the Anaconda slime, the Braden concentrates, and the bronchantite of Chuquicamata) with a relatively small consumption of acid, while in the case of the Chuquicamata ore there is a steady gain of acid. Other striking points were the generality of the idea of precipitating the copper from the solution by electrolysis, using insoluble anodes, of course; the feeling that the difficulties connected with that old proposal have now been thoroughly mastered; and the contemplated introduction into the hydrometallurgy of copper of modern constructional methods, better and more economical than anything ever known before in this art. The 10,000-ton leaching vats at Chuquicamata will make everything else look infantile and trifling.

There is going to be a new hydrometallurgy of copper, and it is going to be very soon. We say this with perfect confidence, inasmuch as the Braden plant is nearly completed, while it will not be very long before the Chuquicamata works are a going concern. In both

these cases the preliminary experimental work has been of such a character and has been done in such a way that there does not remain much doubt respecting the working of the new processes upon a large scale. We shall be clearer, perhaps, if we say that the experimental work has been done on a large scale, but the commercial work is to be done upon a gigantic scale.

⁂

The Future of Lake Copper

The derangement of the copper market caused by the restriction of the supply of Lake copper has already led to noteworthy changes in market conditions. This is well known inasmuch as they exist. There are likely to be, moreover, effects lasting after the strike is over and the Lake production has regained its normal proportions. What these will be cannot perhaps be fully prophesied. We may only have ideas.

The existing change is an increased disparity between the prices of Lake and electrolytic copper. Up to last summer the normal differential was about 0.25c. per lb. At present it may be almost anything within reasonable bounds. Even the price for Lake copper may go up while the price for electrolytic goes down. This results from there being a natural competitive market in electrolytic copper, while in Lake there is a corner, a perfectly innocent, unpremeditated corner, to be sure, but nevertheless a corner.

But why should there be a corner in such a commodity, why should anybody be willing to pay a corner price, why should not consumers turn to electrolytic copper which they can obtain in any quantity desired? Simply because many users of copper are conservative, employ it for delicate purposes, are unwilling to take any chances in experimenting and prefer to pay whatever may be asked for the particular brand of copper that they know and want.

This is not generally the case. For many purposes electrolytic and Lake copper may be used indifferently. The premium on Lake copper has not necessarily reflected superiority. On the contrary electrolytic is purer and of higher electrical conductivity, the advantage of Lake being only in greater toughness. Many users of Lake copper have lately had to resort to electrolytic inasmuch as they could not get anything else. Some of them having had to learn its excellence out of necessity will, no doubt, continue to use it.

The determining factor will probably be the labor cost in the manufacturing process. In the making of wares like cartridge cases, in which the labor cost forms a high percentage, the manufacturer will be likely to adhere to the special brand of copper which his artisans know how to work. An advance of even ¼c. per lb. in the premium for that special brand of copper affects the cost of the finished goods but slightly, while if a lot were spoiled in manufacture, and, of course, the metal is always blamed for factory misadventures, the loss might be large. On the other hand, conditions are quite different in the manufacture of copper sheets, wherein the labor cost is relatively low and the metal cost high. In such cases the newly discovered needlessness of paying any premium may be an advantage worth keeping.

Just how this will be settled when the full supply of Lake copper comes again into the market we shall have to wait to see. Shall we see a reëstablishment of the old premium? Or shall we see a premium only on fancy brands of Lake copper and all the rest of the nonarsenical brands selling simply on a level with electrolytic?

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A Quarter Century on the Rand

During the recent strike, much was made by the labor leaders of the enormous dividends paid by the gold-mining companies, and the alleged inadequate share of the gold coin which accrued to the workers. It should not be difficult to convince the responsible section of the labor party, as well as thinking working men, that such an appraisement of the position is entirely erroneous. The figures both of the Mines Department and the Chamber of Mines are convincingly against such a contention. The Rand has proved no exception to the rule of precious-metal mining—that the miner and the artisan gets by for the largest proportion of the gold actually produced. Since 1887 to the end of last year, just a quarter of a century, the Rand has produced £347,054,851 worth of gold, while the dividends paid to shareholders over the same period have aggregated £88,159,489. In other words, the amounts received by the shareholders represent 25.7% of the value of the gold. The balance was absorbed in working expenditure.

It is somewhat remarkable that the dividends last year and the sums paid to the technical and clerical staffs and the actual wage earners were practically identical in amount, being respectively £7,960,394 and £7,865,000. Each represents about 21% of the gold production. The high remuneration of labor is proved by the actual statistics of wages paid; in December last 11,037 miners and underground laborers, all white men, of course, received 20s. 3d. per shift, and 9332 surface men 16s. 10d. per shift. Excluding the staff, the average amount paid for the year was £316.

While the seriousness of the scourge of miners' phthisis is admitted, it may be pointed out that 45% of the working force are surface workers and therefore free of the dangers which beset the underground worker. The most numerous class is the fitter, of whom 807 in December last, earned 20s. 3d. per shift; 680 winding-engine drivers made about 21s. 10d. per shift, and 250 mill and compressor drivers, from 18s. 6d. to 19s. 6d. Over 500 carpenters earned 20s. per shift, and 260 boiler makers 20s. 2d. Men working in metallurgical plants, many of whom have undergone technical training, did not do so well from a financial point of view, amalgamators receiving about 18s. 6d. a shift, and cyaniders, a couple of shillings less. Both in respect of pay and congenial work, the heavy labor being done by natives, the surface worker on the Rand may rightly be considered the aristocrat of the labor world.

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Judging from references in several publications, the idea appears to have become prevalent that the Mining and Metallurgical Society of America has expressed itself with respect to recommendations for a revision of the Federal mining laws. This is not the case. The mining law committee of the society has made a report and that report has been discussed by the New York section of the society, favorably in part and adversely in part. Neither the council of the society nor the society as a whole has yet taken any action, the committee's report being merely that it is before the society for discussion.

BY THE WAY

A story is told of a "hill billy," who came from a swamp district of southeastern Missouri, to work in the lead mines. He was put to help on the carpenter gang. After starting to work one of the carpenters gave him a rule and told him to measure a piece of timber. Upon completing the job he announced the result as, "One length of the rule, one joint and about this much over," designating one finger length.

❖

Mutations among mines are not uncommon. Many that began as producers of one kind of ore have in the course of time turned into another kind. The Highland Boy mine of Bingham, Utah, is a recent and striking example. It began as a gold mine, in which class it was of no great account. Then it became a rich and profitable copper mine, its performance as such making it famous. It is no longer much good as a copper mine, but lately it has become a first-class lead mine.

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Some men succeed because when they have the opportunity to tackle a job that at first appears too big for them, they brace up and get away with it. Ernest Le Duc, president of the Mesabi-Cuyuna Iron Land Co., tells of one he knew when he was logging superintendent for the Merrill & Ring Co. at Split Rock, on the north shore of Lake Superior. One day he picked out one of the dependable men in his crew to proceed to Duluth, about 35 miles, following the lake shore, to count the Merrill & Ring logs that he might find on the beach. Le Duc did not know it, but the man that he selected could count only to 10. This man arrived at the Duluth office of the company and told E. H. Eddy, to whom he had been instructed to report, that he was prepared to state the number of Merrill & Ring logs on the beach between Duluth and Split Rock, and thereupon he began unloading pebbles from his pockets. Eddy was amazed, and then indignant, until informed that each of the pebbles represented 10 logs.

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There have been many odd packages sent through the new parcel-post system, but perhaps the most unusual to date is 400 lb. of ore sent by John B. Donahue, of Seattle, Wash. Mr. Donahue is a prospector and is working a claim about 13 miles from Lake Cushman. Not being satisfied with a report of $4 to $6 gold per ton, he corresponded with the University of Washington, at Seattle, in regard to a test on his ore. The University required 400 lb. for this test and Mr. Donahue undertook to ship by freight and found the charges were:

Lake Cushman to Hoodsport	$3.50
Wharfage charge at Hoodsport	0.40
Freight by boat to Seattle	3.50
Wharfage charge at Seattle	0.40
Drayage from boat to University	3.00
Total	$10.80

Mr. Donahue objected to such a charge and made the remark that he might as well send it by parcel post, and a friend bet with him that he could do so and save money. He inquired and found the parcel-post charges $1.24 per 100 lb., making a total of $4.96. The parcel post got the job, Mr. Donahue saved $5.84. The only ones to have any objection were the postal carriers in Seattle.

October Mining Dividends

Dividends for October of United States mining companies making public reports amounted to $8,159,716 paid by 39 companies; iron, metallurgical and allied holding companies paid $4,667,163; while Canadian, Mexican and Central American companies paid $2,163,393.

Ahmeek suffered another cut in dividend, having come down from $7 paid six months ago, to $5 paid three months ago, and now to $3. Osceola has also reduced its dividends a second time by 50c. All the Michigan companies have now shown the effect of the strike, except Champion, which paid its ninth $1 dividend during the year. The Dunkin and Lost Packer mines both paid their initial dividends.

United States Mining Companies	Situation	Per Share	Total
Ahmeek, c.	Mich.	3.00	150,000
Anaconda, c.	Mont.	0.75	3,249,375
Arizona, prf., A.	Ariz.	...	5,769
Bunker Hill Con. g.	Calif.	0.05	10,000
Bunker Hill & Sullivan, l.s.	Ida.	0.20	65,400
Butte-Alex. Scott, c.	Mont.	0.50	37,000
Champion, c.	Mich.	1.00	100,000
Colo., Gold Dredging, g.	Colo.	0.25	25,000
Copper Range Con., c.	Mich.	0.50	196,846
Daly-Judge,	Utah	0.15	45,000
Dunkin	Colo	0.05	10,000
Fremont, g.	Calif.	0.02	4,000
Frontier, z.	Wisc.	2.00	2,500
Goldfield Con., g.	Nev.	0.40	1,423,659
Golden Cycle, g.	Colo.	0.03	45,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Iron Blossom, s.l.g.	Utah	0.10	100,000
Lost Packer, c.	Ida.	0.25	37,500
Mary McKinney, g.	Colo.	0.02	26,185
North Butte, c.	Mont.	0.50	205,000
Old Dominion M. & S., c.	Ariz.	1.25	202,500
Osceola, c.	Mich.	2.00	192,300
Snowstorm, c.	Ida.	0.00½	22,493
Stewart, s.l.	Ida.	0.12½	154,783
Shattuck Arizona, c.	Ariz.	0.50	175,000
Tom Reed, g.	Ariz.	0.06	54,573
Tonopah-Belmont, g.s.	Nev.	0.25	375,000
Tonopah Extension, g.s.	Nev.	0.05	47,179
Tonopah Mining, g.s.	Nev.	0.25	250,000
Utah Con., c.	Utah	0.50	150,000
United Globe, c.	Ariz.	7.50	172,500
United Verde, c.	Ariz.	0.75	225,000
Vindicator, g.	Colo.	0.03	45,000
Wasp No. 2, g.	S. D.	0.01	5,000
Yellow Aster, g.	Calif.	0.05	5,000
Yellow Pine, z.l.s.	Nev.	0.01	9,500
Yosemite, g.	Calif.	0.10	2,400
Iron, Industrial and Holding Companies	**Situation**	**Per Share**	**Total**
Amer. Agr. Chem., com.	U. S.	1.00	183,309
Amer. Agr. Chem., pfd.	U. S.	1.50	408,172
Amer. Sm. Sec., pfd., A.	U. S.	1.50	255,000
Amer. Sm. Sec., pfd. B.	Mex.	1.25	375,000
Bethlehem Steel, pfd.	U. S.	1.25	186,350
Cambria Iron	U. S.	2.00	169,360
Guggenheim Exploration	U. S., Mex.	0.75	623,799
General Chemical, pfd.	U. S.	1.50	150,000
Harbison-Walker, pfd.	U. S.	1.50	144,000
La Belle Iron	Ohio	0.50	49,577
National Carbon	U. S.	1.50	82,500
Old Dominion of Me., c.	Me.	1.25	366,691
Pennsylvania Salt	Penn.	3.00	150,000
Republic Iron & Steel	U. S.	1.75	357,296
Sloss-Sheffield Steel & Iron	U. S.	1.75	117,250
U. S. Sm. Ref. & Min. com.	U. S., Mex.	0.75	263,329
U. S. Sm. Ref. & Min., pfd.	U. S., Mex.	0.87½	425,530
Virginia-Carolina Chem., pfd.	U. S.	2.00	360,000
Canadian, Mexican and Central American Companies	**Situation**	**Per Share**	**Total**
Buffalo, s.	Ont.	0.20	200,000
Canadian Goldfields, g.	B. C.	0.0015	60,000
Chontalphan, g.s.l.z.	Mex.	0.50	3,500
Crown Reserve, s.	Ont.	0.02	35,376
Con. Min. & Sm. Co. of Can.	B. C.	2.00	106,104
Dominion Steel Corp.	Canada	1.00	345,896
El Favor, g.	Mex.	0.01	35,000
Hollinger, g.	Ont.	0.15	90,000
La Rose, Con., s.	Ont.	0.25	374,656
Lucky Tiger Combination, g.	Mex.	0.05	35,767
McKinley-Darragh-Savage, s.	Ont.	0.10	134,861
Nipissing, s.	Ont.	0.37½	450,000
Nova Scotia Steel & Coal, com.	N. S.	1.50	90,000
Nova Scotia Steel & Coal, pfd.	N. S.	2.00	20,600
San Rafael, g.s.	Mex.	0.50	1,200
Seneca-Superior, s.	Ont.	0.12½	59,604
Standard, s.l.	B. C.	0.02½	50,000
Wettlaufer-Lorrain, s.	Ont.	0.05	70,829

Dividends for the first 10 months of the year amount to $62,175,610 for United States mining companies; $91,880,823 for iron, industrial and holding companies; and $18,817,816 for other North American mining companies.

PERSONALS

Frederick P. Burrall has returned to New York after a trip of several months in Alaska and Yukon Territory.

F. C. Alsdorf, mining engineer, has opened an office in the Merchants' Exchange Bldg., San Francisco, California.

Stanly A. Easton and J. F. McCarthy are members of the commission appointed by the Governor of Idaho to draft a workingmen's compensation act for that state.

E. J. Carlyle has returned from professional work in Argentina and is spending a holiday in the United States. He recently passed through New York on his way to Montana.

Dr. M. G. Christie, associate professor Imperial College of Science, London, England, is making an investigation of the byproduct coke industry in the United States, representing the Otto interests.

E. W. Westervelt, formerly with the engineering department of the Ray Consolidated Copper Co., has accepted a position in the engineering department of the Braden Copper Co., Rancagua, Chile.

George T. Fonda has been appointed as head of the department of welfare and safety of the Bethlehem Steel Co., South Bethlehem, Penn., with the title of safety engineer. He is a graduate of Stevens Institute.

E. B. Wilkinson, formerly blast-furnace superintendent of the Carbon Iron & Steel Co., Parryville, Penn., later with Ladd & Baker, of Philadelphia, is now superintendent of the Midland blast furnace of the Pittsburgh Crucible Steel Co., Midland, Penn.

Henry N. Thomson has resigned his position as superintendent of the Tooele plant of the International Smelting & Refining Co., at Tooele, Utah. William Wraith has assumed the combined duties of manager and superintendent, and will be assisted by O. M. Ruchs, formerly head chemist at the plant.

Frederick H. N. Gerwig, formerly superintendent of Carrie Furnace, of the Carnegie Steel Co., but for six years past superintendent of furnaces for the Pittsburgh Steel Co., at Monesson, Penn., has returned to the Carnegie Steel Co., as assistant to the general superintendent of the Edgar Thomson works.

James T. Newton, of Georgia, has been recommended to the President for appointment as assistant commissioner of patents. Secretary Lane, after a conference with Commissioner Ewing, recommended Mr. Newton for his recognized administrative ability and thorough training in patent work. Mr. Newton is 52 years of age, and during the 22 years of his continuous service in the Patent Office, had held successively the positions of assistant examiner, law clerk, chief clerk and principal examiner, having been in the latter grade since March, 1895. He is a Georgian by birth, and a Democrat in politics.

H. P. Barry, for a number of years general superintendent of the great Waihi gold mine, in New Zealand, retired from active work, Nov. 1, chiefly on account of the long illness and recent death of his wife. E. G. Banks, who for nearly 20 years has been associated with the Waihi company as head metallurgist, will succeed Mr. Barry as general superintendent. Mr. Garvin, the company's chief engineer, will assume the position of assistant superintendent, and Mr. Williams, who retired some time ago, has accepted the position of consulting engineer. He will visit the mine monthly, or as occasion arises. James Gilmour continues as mine superintendent. He, also, has been connected with the Waihi mine almost since its inception. He is thoroughly conversant with the mine and works.

Dr. Willett G. Miller, provincial geologist of Ontario, was tendered a complimentary banquet at the Toronto Club, on the evening of Nov. 1, and presented with his portrait in oils, by a number of the leading mining men in Canada, in recognition of his services in connection with the development of the mining industry. The chair was taken by G. G. S. Lindsey, of Toronto, and the speakers included Hon. Frank Cochrane, Canadian Minister of Railways; Hon. W. H. Hearst, Ontario Minister of Lands, Forests and Mines; Dean Galbraith, Toronto University; Prof. Goodwin, Queen's University, Kingston; Theodore Denis, Superintendent of Mines, Quebec; R. W. Brock, Director, Canadian Geological Survey; Thomas W. Gibson, Deputy Minister of Mines for Ontario; and H. Mortimer Lamb, Secretary Canadian Mining Institute.

OBITUARY

Robert M. Mein died at Oakland, Calif., Oct. 26. Death resulted from the effects of cold, contracted during a trip into Alaska several months ago. Mr. Mein was a graduate of the University of California School of Mines. Shortly after graduation he was employed as a mining engineer in South Africa. He later became an owner of mines in South Africa and in Alaska and Nevada. He was born in Nevada City, Calif., and was 38 years old. He was a brother of William Wallace Mein, mining engineer, of New York, who went to Oakland to attend the funeral.

Franklin J. King died at Montague, Calif., Sept. 14. He was 87 years old, born in Wheeling, W. Va. In 1846 he enlisted at St. Louis in the First Battalion Missouri Artillery and participated in the Mexican war, under General Kearny. He went to California in 1849, mined in Eldorado County, engaged in merchandise in Sacramento, mined in Shasta and Siskiyou counties, and again engaged in merchandizing in Yreka and followed that business for 40 years. He was married to Miss M. L. Moore, of Champlain, N. Y., in 1856. His wife, three sons and one daughter survive him.

Frank P. Swindler, a resident of Salt Lake City, died at Los Angeles, Oct. 13, from cardiac asthma, due to inhalation of stonedust while operating a dry crushing mill years ago. The dust in his lungs had given him much trouble during the past few years, although few of his friends were aware of his condition. He was a native of Pennsylvania, and before going to Utah was identified with mining at Leadville. He was a well known mining engineer in the West, having held positions as general manager of the De La Mar property in Nevada, in behalf of the Bamberger interests, general manager of the Ohio Copper Co., at Bingham, manager of the Opex Company, at Tintic, and had examined and reported on many properties. He is survived by his wife and three children, the eldest residing in Pittsburgh, and the two younger with their mother in Salt Lake City.

SOCIETIES

Minnesota School of Mines—A new mining and metallurgical laboratory is to be erected for this school at Minneapolis.

Mining and Metallurgical Society of America—A meeting of the New York section will be held at 8 p.m., on Tuesday, Nov. 18, at the Engineers' Club, New York, preceded by the usual informal dinner at 6:30 p.m. The subject for discussion will be the flotation process.

Michigan College of Mines—Professor C. M. Carson is the new head of the department of chemistry, succeeding the late Professor George A. Koenig, who had been head of the department since 1892. Professor Carson comes from the University of New Brunswick, where he has been professor of chemistry and dean of Applied Science. He received his training at the University of Toronto and the University of Chicago, taking his degree of Doctor of Philosophy from the latter institution. Professor Albert J. Houle of the department of mining has returned from his year's leave of absence, spent in mining and smelting in Arizona.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MUFFLE FURNACE. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,076,346; Oct. 21, 1913.)

REGENERATIVE FURNACES—Improvements in Furnaces of the Reversible Regenerative Type. A. Reynolds, London, Eng. (Brit. No. 12,991 of 1912.)

REGENERATOR for Metallurgical Furnaces. Theodore Ludolph Holle, St. Louis, Mo. (U. S. No. 1,076,426; Oct. 21, 1913.)

ROASTING—Agitating Device for Roasting Furnaces or the Like. Maurice van Marcke de Lummen, Cologne, Germany. (U. S. No. 1,076,297; Oct. 21, 1913.)

SINTERING—Improvements in or Relating to the Sintering of Metallurgical and Similar Products. J. Savelsberg, Papenburg, Germany. (Brit. No. 24,565 of 1912.)

SLAG—Manufacturing Slag Products. Carl Heinrich Schol, Allendorf, Germany. (U. S. No. 1,076,657; Oct. 21, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Oct. 29

Smeltery-Fume Investigation has been undertaken by the state commission appointed by the governor in accordance with an act passed by the last session of the legislature. The commission, composed of Dr. W. F. Snow, secretary of the state board of health, Dr. A. J. Cook, horticultural commissioner, and Dr. Charles Keane, state veterinarian, have gone to Shasta County to begin the investigation. The act of the legislature appropriated $5000 for the investigation and provided that the commission should report to the governor upon the damage done to animal life and vegetation by the waste products and gases from smelting works in the state. It is proposed to visit other districts and counties where such plants are in operation The chief smelting outside of Shasta County at present is at the Selby works, at Vallejo, and the Campo Seco plant, in Calaveras County.

Dredging in Upper American River field in California is making positive advancement, although two dredges have been dismantled recently and only one new dredge has been installed. Another will go into commission before the end of the year, which will make three active dredges operating on the river bars in Placer and Eldorado Counties. The Cache Rock dredge which operated between Rocky Chucky cañon and Forest Hill finished working out its ground about the end of September, and the machinery has been removed. The Beaver Gold Dredging Co. dredge working between Loomis and Roseville has also completed its ground, and the machinery goes to the new hull of the Poverty Bar dredge under construction at Butcher Ranch. The Gaylord Mining Co. dredge at Whisky Bar, near Rattlesnake bridge, has been improved, a new bucket line installed, and a fair grade of gravel is being dug. The Pacific Gold Dredging Co. dredge above Auburn, recently put in commission, is making fine progress in yardage and the gold recovery is good.

BUTTE—Oct. 29

Electric-Power Rates in Montana, it is charged by the Public Service Commission, are excessive and unreasonable, and a hearing has been ordered on the subject, to be held in the near future. With the exception of the Helena Light & Railway Co., the rates of which are now under advisement by the commission, every electric-light company transacting business in Montana is made a defendant in this action of the board, and is given 20 days in which to submit for consideration schedules of rates in lieu of those now in effect. This hearing, the most important since the commission was established, was ordered upon the initial motion of the commission and was introduced because of the large and growing number of consumers directly affected. The companies cited to appear before the commission are the Montana Power Co. and its subsidiaries, the Northern Idaho & Montana Power Co., and the Missoula Light & Power Co.

Barnes King Has Made a Fine Showing this year. It has taken over the North Moccasin at a cost of $150,000, and by monthly installments from money earned by operating the North Moccasin it has earned sufficient to pay off the entire indebtedness with the exception of $14,000, which will be paid out of the revenue from the ore treated this month. The net bullion returns for September amounted to $37,499, and the mining and milling expenses amounted to $18,739. During the last month many improvements were made and additions put in with a view of increasing the capacity of the plant. A new double-drum electric hoist and an electric-driven compressor of 540-cu.ft. capacity have been installed at the Santiago shaft. During the last month the company paid $100,000 for the Piegan-Gloster property on which it had an option, and early this month five additional claims adjoining the Piegan-Gloster were purchased at a cost of $7200. It was considered advisable to secure those additional claims as they adjoined the Piegan-Gloster ground, and there was fear that some time after the Piegan-Gloster ground had been thoroughly developed others might come in and secure the adjoining ground and thus give the company some trouble. Those who are familiar with the region say that the Barnes-King directors got a bargain in the additional claims at the price stated. The Piegan-Gloster consists of about 200 acres, about 900 ft. along the strike of the Piegan-Gloster vein. Some fine ore has been opened up and development is going on with excellent results. Arrangements are about completed for the installing of an electric plant, and just as soon as it is completed mining operations will be started on a large scale.

DENVER—Nov. 1

The Strike Situation in the southern coal field has continued with more shooting and killing and other acts of violence, and on Oct. 28, Governor Ammons, after having utterly failed in conference to get the operators or strike leaders to agree to any peace measures, declared martial law and ordered state troops to the affected districts with orders to disarm everyone on both sides, and to enforce obedience to the laws and constitution of the state; 1107 militiamen were ordered out and 775 responded to the call. The strike leaders appear to be in favor of the coming of the soldiers providing they disarm both sides. The governor orders all saloons closed, permits all old miners of the district to go to work and affords them protection, but will not allow the importation of strikebreakers. Two men were killed during the shooting, Oct. 27, and several were wounded; a bridge was dynamited and there were other acts of violence. It is thought that had troops been sent at the outset of the strike, many lives would have been saved, as well as an immense amount of money and much suffering. The first and second regiments of the Colorado national guard arrived at Trinidad the night of Oct. 28. Next morning the mine buildings at Aguilar were burned by armed strikers. Snow was a foot deep in the strike district and the tent colonies suffered greatly. On the night of Oct. 30, the situation was critical as advices were to the effect that 1200 strikers, fully equipped with the best high-powered repeating rifles, were arrayed against about 325 mine guards and the troops, and that an attack on Berwind, Tobasco and Hastings was being planned by the miners. At the auditorium in Denver, on the night of Oct. 30, a mass meeting was held on the coal strike under the joint auspices of the Colorado Federation of Labor and the Denver Trades & Labor Assembly, at which about 4000 people were present and were addressed by White and Hayes, president and vice-president of the United Mine Workers, the burden of their talk being that the miners have no redress when their statutory rights are violated, because "the operators own the courts as well as mines," and they put all the responsibility for the outcome of the present struggle on the governor of the state. Up to the afternoon of Oct. 31, no further fighting was recorded, and the general opinion in the district was, that the strikers would give up their arms peaceably.

CALUMET—Nov. 1

Strikers Applying for Work will be given back their former places and no discrimination will be made as to nationality or federation affiliation, but the companies will use their own discretion in taking men back to work who have been connected with any of the strike violences. This statement was issued by the mine managements through the Copper Country Commercial Club. They also state, that an eight-hour day for underground work will be established on or before Jan. 1, 1914. As a result of this statement a number of men are applying for work, turning in their union cards, particularly among the Finns. A strong movement among the non-socialistic element of this nationality is working toward the men returning to work. Calumet & Hecla has practically as many men employed as it did before the strike was called and rock shipments of over 7000 tons daily are being made to the mills. Preparations are being made to resume hoisting at the Wolverine during the coming week. Allouez and Centennial are increasing production daily as well as the Kearsarge branches of the Osceola. Outside men continued coming into the district during the week, but there were no serious disorders. The hearings of the men arraigned under the injunction ruling was started before Judge O'Brien, but was adjourned after arguments of the attorneys and a decision to proceed with the cases by means of affidavits.

TOWER—Oct. 31

The Vermilion Range has acquired the reputation of being an expensive district to explore. The reason for this is easily

explained. When the blanket formation at moderate depth on the Mesabi range was discovered and it was found that it could be cheaply explored by churn drills, the diamond drilling, and development of ore at a depth of several hundred feet on the Vermilion looked expensive. But the Vermilion has its charms for the explorer for iron ore, for once a mine is located there it is sure to be a valuable one. Dame Fortune may flirt for a long time with the seeker of iron on the Vermilion, but once she relinquishes the secret of the hidden wealth she is generous, for the deposits are large and the ore may be depended upon to be of excellent quality. Men who know the history of the Vermilion pretty well are free in their acknowledgment of great service that was done by Thomas Bardon, of Ashland, in the early days. One of them speaking of the early history of the Vermilion said: "Tom Bardon had the money and the sand. I remember that at one time his associates in the old Pioneer Mining Co. threatened to get out an injunction against Bardon to prevent him from spending any more money sinking the Pioneer shaft. There was a period in the history of the range when Mr. Bardon did much to tide over financial stress and keep things going. He has since been successful in copper, as well as iron, as witness the Shattuck mine in Bisbee, Ariz., and he is entitled to large credit generally as a mining man." It may take more time and cost more to develop a mine on the Vermilion range than on some others, but the prospective reward is easily commensurate with the amount at stake.

HIBBING—Oct. 30

The Draining of the Lake Embarrass Field on the Mesabi in order to permit the mining of the great bodies of ore known to exist there is again reported. The reported plan this time is to shift the course of the Embarrass River so that its waters will flow into the St. Louis or Partridge Rivers. There are many millions of tons of high-grade ore at and under Lake Embarrass, but because of quicksand and water the mining of much of it at present is practically impossible. The Steel Corporation, the Hill interests, Pickands, Mather & Co., and other concerns are interested in the region.

BRAINERD—Oct. 30

The Openpit System of Mining is growing in favor on the Cuyuna range. Three properties will mine by steam shovel next season. These are the Pennington of the Tod-Stambaugh Co., of Cleveland, the Thompson of the Inland Steel Co. and the property of the Pittsburgh Steel Ore Co. The creation of other pits is contemplated. The Cuyuna-Mille Lacs mine is shipping steadily, there being an eager demand for its manganiferous product. A centrifugal pump of 2000 gal. capacity has lately been installed at the property. The Iron Mountain Mining Co. shipped early in October; so did the Cuyler Adams interests, operating the Adams property. M. A. Hanna & Co.'s Barrows mine is accumulating a large stockpile. Properties in course of development are the Duluth-Brainerd and the Brainerd-Cuyuna, the latter within the city limits at Brainerd. The Cuyuna-Duluth mine is shipping, as is the Ironton. Engineers representing the Great Northern Power company have been in the Cuyuna country lately and it is surmised that an 80-mile extension of that corporation's pole lines from Duluth is in contemplation. The district is served with electricity at present by the Cuyuna Range Power Co. At Grand Rapids, on the western Mesabi, practically the entire town turned out to witness the launching of the "John B,," the Interstate Mining Co.'s big dredge, in the Mississippi river. The "John B" is to be used in the experiment of removing overburden by suction dredging, a method never before attempted in mining work in the Lake Superior country. The lands the Interstate company, a subsidiary of the Jones & Laughlin company of Pittsburgh, has under option in the Grand Rapids district formerly were held by the U. S. Steel Corporation, having been relinquished by the latter at the time of the Stanley investigation. The existence of ore was proved by the Steel Corporation. Work now in progress is designed to verify the disclosures made by former drillings.

The Value of Manganese in iron ore is a subject under discussion on the Cuyuna range now, between fee owners and leaseholders. The question raised pertains to the comparative value of the iron and manganese content of the ore, with reference to the royalty to be paid thereon. As most of the leases, of necessity must be made before the actual value of the manganese content can be determined, the result has been a diversity of endeavors to obtain commensurate returns for the ore, from the fee owners' standpoint, and to safeguard the operator as well. It has been held that ore containing less than 20% manganese should not entitle the ore to a premium. Others maintain that 15% manganese should be the free limit. Practically all leases now drawn up contain the manganese clause. Sometimes this provides that if the manganese content be found to exceed the iron content, then the royalty shall be a fixed percentage of the value of such ore at lower Lake ports. Just why the operator is made to pay the fee owner a percentage on the hauling charge of this ore, is not clear. In case of increase of freight rates, the operator would have to bear a double burden. Again, some leases provide for royalty payment on basis of value of the ore at the mine. A confusing element arises when the ore goes into stockpile. As on all other ranges, the Cuyuna leases provide that royalties need not be paid on ores until they are actually shipped from the property. This works very well on the "per ton" basis, with only the iron content to consider, but it is difficult to adjust the percentage royalties on the widely varying manganese content. A separate analysis of each carload when actually shipped seems the logical solution. Finally, comes the concentrating clause, which permits the ore to be concentrated either on or off the leased property, as the case may be. No concentrating plant is now in operation, but several are planned. Concentrating is usually done for two purposes; to reduce freight costs and to remove undesirable constituents. The leaseholder whose lease provides that he pay 10% of the value of his manganiferous ore at Lake Erie ports, as royalty, and who then desires to concentrate his material before shipping, has a mathematical problem confronting him. The peculiar conditions existing on the Cuyuna range would certainly seem to call for extremely careful wording of leases.

CORDOVA—Oct. 12

The Klondike Production of gold totals approximately $175,000,000. These figures are made up from Canadian royalty returns, American consular export records of earlier days and other sources. Of this grand total no less than $150,000,000 has come from the territory lying within a radius of 50 miles of Dawson. The most notable of producing creeks have been Bonanza, Eldorado, Hunker, Dominion, Gold Run, Sulphur, Quartz, Last Chance and their tributaries, and hills and benches along the creeks. The chief output today is coming from Bonanza, Eldorado and Hunker Creeks and the Klondike River, where 12 large modern dredges are operating, and from the benches of Eldorado, Bonanza and Hunker, where many hydraulic plants are at work. The total yearly gold shipments from Dawson and nearby creeks, including those made by the pioneers who worked on the Stewart, Forty Mile and other creeks before the strike of the Klondike, are as follows: 1885-1886, $100,000; 1887, $70,000; 1888, $40,000; 1889, $115,000; 1890, $175,000; 1891, $40,000; 1892, $87,500; 1893, $176,000; 1894, $125,000; 1895, $250,000; 1896, $300,000; 1897, $2,500,000; 1898, $10,000,000; 1899, $16,000,000; 1900, $22,275,000; 1901, $18,000,000; 1902, $14,500,000; 1903, $12,250,000; 1904, $9,413,074; 1905, $7,162,438; 1906, $5,258,874; 1907, $2,896,173; 1908, $3,282,684; 1909, $3,960,000; 1910, $4,550,000; 1911, $4,634,000; 1912, $5,018,000; 1913 (eight months), $5,000,000; supplementary, $25,913,527 and total $174,652,411. By supplementary is meant the gold from the Forty Mile, Eagle and other nearby camps on the American side tributary to Dawson, which have shipped virtually all their gold through that place and gold from the Klondike in early days, which is acknowledged to have escaped duty long.

TORONTO—Oct. 29

An Important Decision has been rendered by the Supreme Court of Canada in a case affecting the jurisdiction of the federal and provincial governments over incorporated companies, after litigation extending over four years. The principal issue was the right of the provincial governments to incorporate companies to do business outside their limits, which was questioned by the federal government. The court sustained the provinces' right to incorporate companies.

Recent Oil Discoveries near Okotoks, Alberta, are to be investigated by the Canadian Department of Mines which is now taking the preliminary steps to such an investigation. A. B. Dowling has been commissioned to make a geological survey of the district, with a view of determining the probabilities of large deposits. The oil samples received by the department indicate a high-grade oil. The board of trade and city officials of Calgary issued, Oct. 24, a warning to the public stating that after several months of boring crude petroleum in limited quantity had been struck Oct. 7 at a depth of 1562 ft. on the property of the Calgary Petroleum Products Co. Ltd. It is impossible to state whether the oil found merely came from a seepage or indicates the existence of a large deposit. Boring continues with some promise of ultimate success, but until oil has been struck in volume the public is warned against placing too great confidence in circulated reports and particularly urged to exercise care in investments in oil leases or stocks.

THE MINING NEWS

ALASKA

THE COPPER CENTER STRIKE of placer gold recently made about 100 miles from Valdez is arousing considerable interest. The district is reported to be a large one, lower in altitude than the Chisana and more accessible.

EBNER GROUP upon which U. S. Smelting, Refining & Mining Co. has taken option, was one time controlled through stock ownership by California Nevada Copper Co., now in bankruptcy, which was succeeded by Alaska Ebner Gold Mines Co. Practically no development work of importance was accomplished on the Alaska claims, due largely, it is understood, to lack of sufficient funds. When Alaska Gold Mines Co. was formed the Ebner was so seriously tied up in litigation that its acquisition could not have been considered at that time even had the new company so desired. Arrangements were made several months ago whereby the United States company was to advance sufficient money to carry on some development work in hope of picking up either a continuation of the adjoining Juneau development, placed at considerably more than 100,000,000 tons, or locating the general gold-bearing belt of the district. This work has been undertaken through a tunnel which has been driven several hundred feet. The United States company, it is said, has agreed to spend between $200,000 and $300,000, taking receivers' certificates for money so advanced.

NEWSBOY (Cleary)—A call has been issued for bids for the delivery of 1000 cords of wood at the mine. It is reported that L. M. Drury, the Fairbanks assayer, will succeed Louis Golden, resigned, as general manager.

TATUM-IRVING (Port Wells)—Colonel Millard has taken a bond on the property and has a force of men clearing a site for a mill. It is estimated that there is already $100,000 worth of ore in sight, most of it of high grade.

TOLOVANA (Cleary)—Work has been resumed at this property on a vein of exceptionally rich ore that was discovered recently by surface trenching. A prospect shaft has been sunk about 30 ft., and 50 ft. of drift have been driven. The new discovery lies up the ridge from the vein on which several hundred feet of adit had previously been driven, but it is thought by the management that it can be reached underground by a 60-ft. crosscut from the end of the adit.

ARIZONA

Gila County

SOUTHWESTERN MIAMI (Miami)—Drilling is proceeding at a satisfactory rate, and since the erection of coal bins at the terminus of the Live Oak branch of the railroad, steadier and more economical operation is assured. Hole No. 15 is now 1155 ft. deep. No. 16 has reached a depth of 787 ft., and No. 17 is down 449 ft. Nos. 15 and 16 are in the silicified schist.

INTERNATIONAL SMELTING & REFINING CO. has bought 32 acres of nonmineral territory from Miami Copper Co., upon which smelting works will be built to reduce concentrates from Miami and Inspiration mills. Land lies in northern part of Miami property. Proposed plant will be about one mile from either mill. Ground has already been broken.

INSPIRATION CONSOLIDATED (Miami)—Within another week riveting will have been commenced on the ore-storage bins. Steel is being placed rapidly, all columns on the south side bins now being in place. Sheet steel is being bolted in place and practically all of the sheet steel has been placed for one compartment of the bins at the east end. Foreman Wissner estimates that it will take about six weeks longer to bolt all steel in place on these bins. The placing of steel will be closely followed by riveting machines. All steel is now in place for the concentrator warehouse and machine shop and riveting was started Oct. 21. Work will shortly start on the steel trestle reaching over the concentrator bins. Within a few days steel will commence to arrive for the main east and west shaft headframes. This will be a twin frame fastened together for the two shafts, the main west frame being 165 ft. high while the main east will be 185 ft. high. Work on them will commence as soon as the steel arrives. Excavation is now in progress, just east of the main shafts where an electrical supply building, air-compressor plant and several smaller buildings will be erected. It is expected that this excavation will be completed and concrete poured all ready for steel erection within 30 days. However, as considerable excavation will be necessary, it looks very doubtful as to the progress being as rapid as estimated. As soon as the retaining walls and other concrete foundations have been completed work will start on the large concentrator. Surveyors have been at work lately on the hills adjoining Webster gulch, and it is expected that the erection of a number of dwellings will soon be started.

Maricopa County

MONTE CRISTO (Wickenburg)—The new hoist on the No. 1 shaft is in operation and sinking has been resumed. The old hoist has been moved to the No. 2 shaft. Each shaft is to be continued to a depth of 1000 ft. The No. 1 shaft at present has reached a depth of 670 ft. with several thousand feet of drifting. At a depth of 1000 ft. a long drift will be driven to connect the two shafts.

Mohave County

HOT TAMALE (Chloride)—Since recently made strike, mining force has been increased. Owners intend to develop extensively and later build mill.

ARIZONA SOUTHWESTERN (Kingman)—New mill was put in commission Oct. 23. Some readjustment of launders and sizers will be necessary, otherwise work is satisfactory.

Pinal County

GOLD BULLION—Tests are being made on the ores from this mine with the Krom dry concentrator in the laboratory of A. L. Pellegrin, at Tucson.

LAS GUIJAS (Amadoville)—The output of tungsten concentrates from the Bent & Sampson tungsten property for the first two weeks in October was a little over four tons.

Yavapai County

COMMERCIAL (Skull Valley)—Two auto trucks of three tons capacity made by Lauth-Juergens company will be used to haul ore from mine in Copper Basin to Skull Valley. Mine is producing at rate of 150 tons per day.

Yuma County

FORTUNA (Yuma)—Continuation of vein from which much high-grade ore was shipped during ownership by C. D. Lane has been found and shows wide shoot of $35 ore. New management has turned some of the old drifts and shafts into a reservoir by building concrete dam in cañon near mouth of shaft; this water will be used for mill and camp needs.

CALIFORNIA

Amador County

AN ACCIDENT TO A MINER, employed in the Zeila mine at Jackson, resulted in the loss of both eyes by an accidental explosion of dynamite while working in the 250-ft. level, Oct. 13. The miner's face was also badly torn and his body as well. It was supposed that he struck a missed hole with his pick; his eyes had to be removed.

PLYMOUTH CONSOLIDATED (Plymouth)—The winze has been deepened to a depth of 2000 ft., a station has been cut, and drifting was begun about Oct. 1. The ore is looking well at this level, which is 400 ft. deeper than the old workings. Some drifting in fair grade of ore was done on the 1850-ft. level. This is an old mine that was a large producer in the early days of California quartz mining. The prospecting is being done by the California Exploration Co., a subsidiary of Bewick, Moreing & Co. Albert Burch, of San Francisco, is manager.

Butte County

SOUTH BANNER MINING CO. (Oroville)—The capital stock has been increased from $50,000 to $250,000. It is reported that a syndicate of Englishmen will take over the property.

PROGRESSIVE PLACER MINING CO. (Iowa Hill)—High-grade gravel is reported at this mine. A drag-line scraper is used.

EXCELSIOR (Forest Hill)—This mine has been taken over by Mr. Englebright, of Nevada City. The old Baltimore tunnel will be cleaned out, and will be advanced 800 ft. into Excelsior ground. Electric power will be installed.

PACIFIC GOLD DREDGING CO. (Auburn)—The reconstructed dredge built of the machinery formerly used on Pacific No. 1 dredge, in the Oroville field, and a new hull, was put in commission, Sept. 30, on middle fork of American River. The construction occupied 73 days from the date of landing the lumber for the hull to the starting of the bucket line. This is record work in dredge building.

Plumas County

CROWN POINT (Quincy)—It is reported that this mine has been purchased by F. W. Johnson, of Sacramento. The 10-stamp mill will be put in commission in December.

GOLD LEAF (Spring Garden)—The 5-stamp mill is crushing good ore, said to assay as high as $10 per ton. Gross, Sutton, Hammock & Look, of Sacramento, are operating on a royalty basis.

PLUMAS-EUREKA (Quincy)—It is reported that negotiations are pending for the sale of this mine to Eastern men. This is one of the oldest mines in the state and has a record of more than $2,000,000 paid in dividends.

Shasta County

MOUNTAIN COPPER CO. (Keswick)—Ore from the Hornet mine is being shipped at the rate of 250 cars of 50 tons each per month. The machine shops and railroad of the company at Keswick are employing 100 men.

GLADSTONE (French Gulch)—Retimbering of the first 400 ft. of the 1100-ft. shaft is completed, and 50 of the men laid off in September have returned to work, making a total of 150 now employed. The old hoist will be used until the new electric hoist is installed.

BULLY HILL (Winthrop)—John B. Keating, manager, states that work at the smelting plant is progressing and has reached a point where it is thought that a commercial demonstration of the process for saving the zinc in the ore can be made within 90 days. The directors have recently visited the property to witness the tests.

Sierra County

LEE (Sierra City)—A commodious boarding house has been completed at this property, and other improvements are progressing, looking to the employment of a large crew of men throughout the winter months.

COLORADO

Clear Creek County

SEATON—A 3-ft. vein of $40 ore has been opened in the east drift from the Newhouse tunnel.

NATIONAL (West Argentine)—Development work will be continued throughout the winter, and with this end in view supplies are being shipped to the mine. Recent developments have been encouraging.

PAPOOSE—Development will be resumed at this property near the head of Virginia Cañon, and the shaft which has been sunk 100 ft. on a 4-ft. vein of $8 ore, will be sunk another 100 ft. An electric hoist is to be installed.

SUN AND MOON—This property was recently reopened by Olsen & Anderson, under lease. Ore shipments are being made to the Combination mill at Idaho Springs. It is intimated that the production will be increased in the near future.

TERRIBLE-DUNDERBERG (Silver Plume)—Early in 1913 an option on the control of these silver-lead-zinc mines was taken by Gay & Sturgis, of Boston. Work began in May and continued for three months, under the supervision of Arthur L. Carnahan. Favorable consideration is being given now to the plan of operating the property, and for the purpose of holding the option and directing the work the Terrible-Dunderberg Mining & Power Co. has been organized. Should work go on as planned, extensive development would be done to create suitable ore reserves before the milling plans are outlined. The properties have a very large number of openings from which production was obtained in earlier operations. The property is partially equipped, including a large mill building erected during recent years, and has a water-power plant, including a mile of pipe line that is operative seven to eight months in the year.

Eagle County

PROSPECTING WORK is being done, but so far Lady Belle is the only regular producer in Bush Creek district. That mine employs 28 men and is shipping 13 tons daily of 52-oz. silver ore. Vein is a contact between sandstone and schist and dips at 35° and is well defined. Ore has been found in Dakotas north of the Lady Belle and a test carload has been shipped. At head of Lake Creek in Eagle County, East Lake Creek Mining & Milling Co. has driven a tunnel 3100 ft. and one vein just intersected is 20 ft. wide and assays $6 per ton with 8-in. streak on footwall that runs $87 per ton, a carload of which has been shipped. Another vein, the Anna, has 3 ft. of $30 ore.

Lake County

SILVER BOW MINING CO. (Leadville)—Having taken over holdings of Big Four, on Breece Hill, has commenced shipping silver-lead ore carrying gold to Arkansas Valley plant.

Teller County

GOLDEN CYCLE (Goldfield)—At the 1600-ft. level of the Legal Tender claim, an important strike has been made, the oreshoot being 15 ft. wide. Carload lots sent to the Golden Cycle mill show the ore to be worth $40 per ton.

REQUA-SAVAGE (Cripple Creek)—Trail claim has been leased for three years to E. S. Johnson, president of the Blue Bird, and will be worked by a lateral from Blue Bird shaft, which is 1750 ft. deep, deepest in the district.

IDAHO

Cœur d'Alene District

MOON CREEK (Osborne)—A three-compartment shaft will be sunk starting at a point between the two veins. It is planned to crosscut to both veins every 100 ft.

CROWN POINT (Wardner)—A lease has been obtained on the upper workings. The property was at one time one of the greatest producers in the district. It has been idle for some time and still contains considerable ore which will now prove profitable.

BENTON (Burke)—Ore has been encountered in the shaft, which is down only 15 ft. The shaft was begun in the creek level tunnel only about 25 ft. from the surface. A great deal of work has been done on the property in the past but no ore was encountered until the shaft was begun.

LUCKY BOY (Pine Creek)—A shaft is being sunk on the vein, and from present indications ore will soon be encountered. This property is entangled in the Pine Creek land controversy, as to whether the property is more valuable as mineral or agricultural land. The vein is the same as the one in which the Hypotheek struck rich ore recently.

STEWART (Wardner)—The gross value of mine and mill products for the quarter ended Sept. 30 totaled $335,032; net earnings, $204,802; miscellaneous income, $314; development and prospecting, $14,681; net income, $190,435 at the rate of over 60% per annum on the capitalization of $1,238,362; cash Sept. 30, $451,851; quarterly dividend of 10% and 2½% extra paid Oct. 3.

H. E. M. (Burke)—Financing for mill construction and tunnel driving that is expected to put the property on a producing basis, has been completed. A new tunnel has been started from Dago Peak, tapping the ore at depth of 260 ft. under the No. 3 level, the lowest yet attained, and will furnish an outlet for ore on the mill-site on the bank of the Cœur d'Alene River. The machinery has been purchased and is being installed.

GOLD BACK (Murray)—A 6-ft. vein of ore, half of which is first-class, has been found in an opencut. It is one of the best surface showings ever made in the district. The vein can be traced for miles across the country, but this is the first pay shoot ever opened on it. It is planned to open the vein at depth, which can be done with a short tunnel. The strike has caused no little excitement and development work will be pushed as rapidly as possible.

Kootenai County

WATERS MINING COMPANY (Springston)—An old property in which many Easterners are interested. Operations have been resumed with small crew. Victor Waltman, formerly county commissioner of Kootenai County, and treasurer of the mining company, has replaced F. Waters as manager.

MICHIGAN

Iron

PICKANDS, MATHER & CO. (Iron River)—Bengal, Fogarty, Caspian and Baltic mines were shut down Oct. 27 because unexpected order was received from Cleveland to stop all ore shipments. None of the mines were ready for stocking ore and so no mining will be done until surface work is completed, which will be within a few weeks as a large force is employed.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—A drill has been placed in operation short distance south of old Saginaw mine and old-time miners believe that ore of a good grade will be encountered. Saginaw was an active producer years ago, as were Goodrich, New England and Albion properties nearby. Saginaw is four miles from Ishpeming and reopening of that district would mean much for the town.

JONES & LAUGHLIN (Ishpeming)—Work has been started on mine which is going to be opened near Iron Mountain Lake. An old shaft, sunk several years ago, will be deepened several hundred feet, where drills have located good ore. Chicago & Northwestern Ry. will construct side track to property from Cascade. District was active one several years ago but little work has been done during last 25 years. Most of the men will be transferred from the Lake Angeline mine, which is about exhausted.

MINNESOTA

MINNESOTA STEEL CO. (Duluth)—The plant of this subsidiary of the Steel Corporation is now about 75% completed. It will be ready for operation by the autumn of 1914, but on account of the approach of winter the plant may not be put into its full blast before the spring of 1915. The plant will have a new organization, all new machinery, and a new waterworks to try out in winter weather, and these conditions are expected to keep the new plant from operating at full capacity before the following spring, in 1915, but when it is completed the Duluth steel plant will be the last word in steel-plant construction. It will be one of the largest and most modern of its kind.

Cuyuna Range

PENNINGTON (Crosby)—This mine's 1913 order, 100,000 tons, has about been filled, and it is expected that stockpiling will begin shortly.

CUYUNA-DULUTH IRON CO. (Ironton)—Now producing 100 tons daily. The orebody of this company, while small and definitely outlined, is of high grade, averaging above 60% iron.

BRAINERD-CUYUNA MINING CO. (Brainerd)—Shaft sinking continues. A depth of 45 ft. has now been reached, and some water is being encountered. The Northern Pacific Ry. has constructed a spur to the property.

BARROWS (Barrows)—Shipping from stockpile will begin shortly. The mine has about 12,000 tons in stock. This is the only stockpile of a shipping mine on the Cuyuna range which has not been shipped this season; in fact, no other shipping mine on the range has any of last season's ore in stock now.

CUYUNA-MILLE LACS (Crosby)—Now shipping about 300 tons per day. To date 1500 ft. of drifting has been done. Negotiations now pending for the sale of the entire 1914 production of this shaft. Recently, two small cargoes were shipped from the Northern Pacific dock, one going to Pittsburgh Steel Co. and the other to the Standard Steel Co., of Parry Sound, Ontario. The cut-and-slice system is being adopted in the mine.

Mesabi Range

OLIVER IRON MINING CO. (Chisholm)—Orders were received Oct. 23 to discontinue all ore shipments until further notice. The mines affected are the Leonard, Monroe and Chisholm. The mines did not cease operations, but began stocking ore. It is thought the cessation is but temporary, and that shipments will be resumed soon.

OLIVER IRON MINING CO. (Biwabik)—This company still has 20 drills in operation near Biwabik and McKinley but it is impossible to obtain information regarding the results. Most of the work is being done on land belonging to the Higgins heirs. The options will expire in a short time and it is believed that then some definite announcement will be made.

Vermilion Range

McCOMBER (Ely)—It is believed that this mine is to develop into a fine property as drill records look promising. Shaft is being sunk and has passed through 30 ft. of ore of good grade, which appeared to be dipping to north. After sufficient depth has been attained, drifting into ore will be started and extent of deposit will be ascertained.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

HOUGH LAND (Webb City, Mo.)—A new strike of lead ore has been made by Harrison, Eldridge & Julian.

COURTWRIGHT & CO. (Joplin, Mo.)—Lead turn-ins are being made, operations being in progress at 50-ft. level.

GALENA ZINC MINING CO. (Galena, Kan.)—Low price of ore has caused operations to cease, at least temporarily; has been operating Alabama Coon.

MALANG MINING CO. (Spring City, Mo.)—Seven drills are at work on lease of 20 acres; largest number of drill rigs ever operating simultaneously on a tract of this size. Seven shafts already are situated on lease, all in ore.

KRAMER (Cave Springs, Mo.)—This mine, once one of the most prolific producers of the district, has been closed down, leaving the Big Brownie now the largest Cave Springs property. The Kramer mill is to be disposed of.

W. O. CRAGG (Joplin, Mo.)—The new concentrator is in operation on the James Luke land. It has a capacity of 300 tons. An old mill is situated nearby and both will be kept in operation. Considerable mineralized ground has been blocked out.

MONTANA

Butte District

TIMBER BUTTE MILLING CO. (Butte)—At the present rate of progress the new zinc concentrator will be ready to go into commission soon after the first of the year.

BUTTE CENTRAL (Butte)—An effort is being made to settle the financial difficulties of this company so as to admit of the Ophir mine being reopened. It is contended that there is some good ore in the mine which can be treated at a profit at the concentrator. The shaft is down to a depth of 1000 ft., and among mining men the impression prevails that at greater depth ore of a good commercial grade would be encountered.

TUOLUMNE (Butte)—The shaft has reached a point near the 2400-ft. level and it is probable that a station will be cut at that depth and cross-cutting to the veins will be started. The management is undecided, however, whether to continue on to the 2600-ft. level before doing any development work. Good ore was recently cut on the 800-ft. level in a heretofore undeveloped territory. A little work has been done since the strike, but the ore opened has a width of 10 ft. carrying between 4½ and 6% copper. The first shipment of first-class ore made in the last five months was sent recently to the Washoe works.

NORTH BUTTE (Butte)—According to present indications the shaft of the Granite Mountain mine will be down to a depth of 2800 ft., a station cut and connection made with the Speculator shaft by the first of the year. An inspection of the Speculator shows that with repairs being made from time to time there will not be any necessity for the closing down of the shaft for many months yet. The big electric hoist to be installed for the operation of the Granite Mountain will be delivered by spring and possibly early in the coming summer the Speculator shaft will be closed down for retimbering throughout. This will not in the least interfere with the output of the North Butte, as all the ore will be hoisted through the Granite Mountain.

REINS COPPER (Butte)—The fractional claims of this company now are controlled by the Anaconda company, having been secured lately through the purchase of judgments outstanding against the company. The claims adjoin the Leonard mine and are considered valuable. Several years ago the Reins company, chiefly controlled by Eastern men, among the most prominent being Colonel Guffey, of Pennsylvania, spent a large amount of money sinking a shaft to a depth of 1200 ft., and in addition did considerable development work. It had a capital of $3,000,000, but when the panic came some five years ago the Eastern men found themselves unable to finance the company further and the property was closed down. Colonel Guffey had a claim against the company for a note of $130,472, and it is understood that he made an arrangement with the Anaconda to take the property over for him with the privilege of redeeming it.

PILOT BUTTE (Butte)—Vice-president Kelley of the Anaconda company has been called to New York, and it is generally understood that among the matters to be considered is that of the injunction proceedings recently brought against the Pilot-Butte company. It appears that there exists a considerable difference of opinion as to the real ownership of the ground in dispute, and for the purpose of determining that question the Anaconda company has consented to a postponement of the hearing until March. In the meantime both companies will have men at work endeavoring to decide the question of ownership, and it may be that when the time arrives for the case to go to a hearing there will be a motion for its dismissal. There is no disposition on the part of the Anaconda company to take any advantage of the Pilot Butte or any other company, the sole desire in bringing the suit being to settle for all time the right to the ground. The Pilot-Butte is still conducting mining in other portions of its property.

NEVADA

Churchill County

KINNEY SALT DEPOSIT (Fallon Mountain)—A force of men is now at work taking out a 200-ton shipment of salt for the local and export market. With better transportation facilities this deposit would be an important producer.

Clark County

YELLOW PINE (Goodsprings)—The mill now produces daily about 65 tons of zinc concentrate and 15 tons of lead concentrate, the capacity having been augmented by additions to the concentrating equipment during the last few months. The new oreshoot on the sixth level has been opened for a distance of 200 ft. on the strike, in width averaging in excess of 25 ft., and a winze is being sunk to determine its depth. The ore is remarkably clean, averaging 40% zinc, 12% lead and 8 oz. silver. In order to facilitate the mining of this ore and that on adjacent levels, it has been decided to sink a new three-compartment shaft from the surface and a new 50-hp. gasoline hoisting engine will be purchased. The management has also decided to install a sorting plant at the mine to relieve the mill plant. The new 100-hp. gas engine, burning low-grade fuel, is now in operation at the mill and has resulted in a considerable saving in fuel costs.

Humboldt County

SHIPMENTS FROM ROCHESTER now average two railroad cars per day. Ore is shipped by rail from station of Nenzel, formerly known as Oreana.

WEAVER CONSOLIDATED (Rochester)—Ore was discovered recently on south extension of main Nenzel vein at depth of 350 ft. This is the greatest depth at which ore has been opened in the district to date.

PACKARD (Rochester)—Ore is being shipped from a shoot 4 ft. wide which has been uncovered for 200 ft., plow and scraper being used to strip overburden. This shoot assays well in silver, and gold appears to increase in amount with depth. A new vein, 400 ft. from old workings, has been discovered. Leases will be granted on portions of the ground in order to rapidly increase production. Erection of a mill with profits from high-grade shipments, in order that large tonnage of low-grade ore can be profitably treated, is contemplated.

Lyon County

BLACK COPPER GROUP (Yerington)—Operations will be resumed in the near future.

COPPER BELT R.R. (Mason)—Five more auto trucks have been put into service hauling freight from Hudson station to Aurora. At present 12 auto trucks are hauling from Aurora.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at smelting plant for week ended Oct. 23, 1913, were as follows: From Mason Valley mine, 2245 tons; from Nevada-Douglas, 1163 tons; from others, 818 tons; total, 4226, or daily average of 604 tons. During same week five cars of matte were shipped.

Mineral County

PINE GROVE MINING CO. (Pine Grove)—The 60,000-volt power line of Truckee River General Electric Co. was cut in recently, and the 10-stamp mill is ready for operation.

NEVADA CHAMPION COPPER CO. (Luning)—Property was sold recently to W. C. Reynolds, of Goldfield. Work will be started at once, and a 25-hp. hoist will be installed.

Nye County

WHITE CAPS (Manhattan)—A shoot of good-grade ore has been developed between the 165- and 300-ft. levels. In the west drift on the 300-ft. level a shoot 100-ft. in length has been opened. Ore is being shipped to the Western Ore Purchasing Co.

UNION NO. 9 (Manhattan)—Drifting on the 580-ft. level toward the oreshoots, which have been mined on the levels above, is in progress. The increased flow of water encountered in sinking the last 100 ft. of the shaft is now being handled by a larger pumping plant.

Washoe County

MINERAL GROUP (Reno)—A shaft is being sunk on this property, which is five miles northwest of Reno and adjoining the Nevada Central Co.

RED METALS CO. (Reno)—Shoot of ore rich in bornite has been opened on this property, six miles northeast of Reno; also carries gold and silver.

TOHOQUA MINING CO. (Leadville)—Shaft is 600 ft. deep and levels have been opened every 100 ft.; 50-ton concentrator is running steadily. Wagon haul of 40 miles to Gerlach, nearest accessible railroad point, will be shortened 15 miles by construction of road to Trego.

NEW MEXICO

Socorro County

DEADWOOD (Mogollon)—Raise on fourth level has opened into excellent milling ore.

ERNESTINE (Mogollon)—Two slime tanks are being added to mill equipment, made necessary by recent increase in crushing capacity.

SOCORRO MINING & MILLING CO. (Mogollon)—Clifton tunnel, driven on Queen vein, is expected daily to tap large body of water encountered in 500-ft. level in mine last year, which was bulk-headed at the time. Good mill ore has been opened at several places in tunnel.

PACIFIC (Mogollon)—Adit tunnel was recently completed to south endline, making connections with old workings in Confidence mine, which has been stoped out to Pacific line for a depth of 235 ft. Mine now has excellent ventilation, which will accelerate other development work being done.

LINCOLN (Mogollon)—Sinking of No. 1 winze has been stopped until new 25-hp. gasoline hoist, recently shipped ,is installed. Old 8-hp. hoist was unable to raise muck and water, which latter continued to increase with depth. A small compressor will also be operated and machines will be used in sinking. Station at winze is being enlarged to accommodate new equipment.

NORTH CAROLINA

Mecklenburg County

PARTRIDGE SMELTER (Charlotte)—This plant erected here in the early part of the year has been sold. The new owner is a mining corporation owning land containing both iron and lead deposits, and it is reported will use the furnace for experimental purposes.

OREGON

Jackson County

A DISCOVERY OF GOLD ORE has been made by A. D. Walters, working on the survey of the new permanent highway over the Siskiyous. He has caused no little excitement by bringing in a few samples of gold ore taken from a vein found in the survey of the road. The ore is rich in gold and no doubt a rush will be started for the diggings, as the find is easily accessible. It has always been thought that the gold deposits of Jackson County were all in the western foothills and toward the coast, the Siskiyou range being regarded as a dead prospect. The vein struck is 3 ft. wide and well defined.

Josephine County

GOLDEN DRIFT MINING CO.—Judgment for plaintiff stockholders has been rendered by Judge Calkins in the Josephine circuit court in the case of the company against C. W. Ament, the original promoter of the enterprise. This is a suit which has been pending since 1909, and is familiarly known as the Ament dam litigaton. Orginally a mining promotion, it later developed into a plan involving irrigation features, as well as affording water for mining purposes. The decision practically compels Ament to account for moneys received in behalf of the mining corporation. The Golden Drift company was originally capitalized at $1,500,000, of which $150,000 has been expended on the dam project.

Multnomah County

U. S. STEEL (Portland)—Officials of this company have obtained 800 ft. of river frontage with docks and warehouses, from which their Northwestern business will be handled. It is understood that construction work will soon commence so that the plant will be ready immediately following the completion of the Panama Canal. It is planned then to ship the products of the Eastern steel mills to Portland by water and distribute them from that port.

UTAH

Beaver County

MAGNOLIA (Star District)—This property of four claims has recently changed hands. Development has thus far been carried on by means of a windlass and bucket. There are about 50 tons of shipping ore on the dump, with 2 ft. of ore of the same character in the bottom of an 80-ft. winze.

Juab County

CROWN POINT—Operations have been suspended until spring.

KING WILLIAM (Eureka)—An 8-in. air line has been installed on the 1600, and another shift added.

IRON BLOSSOM (Silver City)—A dividend for the fourth quarter of the year of 10c. per share or a total of $100,000 has been declared.

GRAND CENTRAL (Robinson)—Timbering the shaft between the 400 level and the surface has practically finished, and shipments will soon be resumed.

Salt Lake County

UTAH METAL (Bingham)—Silver-lead ore has been opened from the 1100-ft. drain and transportation tunnel.

NEW ENGLAND GOLD & COPPER (Bingham)—This company's property, consisting of mining claims, a mill and mill site, water rights, machinery, etc., is to be sold to satisfy a judgment secured by the Bingham Coal & Lumber Co.

UTAH CONSOLIDATED (Bingham)—A dividend of 50c. per share or $150,000 has been declared, two dividends of like amount having been paid earlier in the year. The total of dividends by this company, including the present one, will amount to $8,950,000.

ALTA CONSOLIDATED (Alta)—At the special stockholders' meeting held Oct. 10, the capitalization was increased from 300,000 to 500,000 shares. The additional 200,000 shares will be placed in the treasury to be used for development. Ore is being shipped over the tramway to Tanner's Flat, and hauled by wagon to Sandy. A winze which is being sunk in a new part of the mine from one of the sublevels is down 40 ft. The ground here looks promising.

Summit County

SILVER KING CONSOLIDATED (Park City)—The 1800-ft. station and sump in the main shaft are practically completed, and the McIlwee company will soon finish its contract, removing all machinery and supplies. The work of opening up the ore cut shortly before the 1500-ft. level was reached will be started immediately by the company.

DALY-JUDGE (Park City)—The McIlwee contract for carrying on development work has expired, and the company has taken in charge all underground development work. During the last year approximately 2000 ft. along the trend of the vein system was opened. The company will develop by raising on various fissures, etc. Shipments of first-class ore have been increased during the last few weeks.

SNAKE CREEK TUNNEL—One thousand feet of tunnel has been completed by F. T. Williams, who is doing the work under contract. Operations have been suspended for a time, while an electric haulage system is being installed. This will make possible an increased speed, the maximum monthly footage with animal haulage being 300 ft. During the last few weeks another water course has been cut, and the flow in the tunnel has been materially increased. Plans are being drawn for a storage reservoir at the mouth of the tunnel.

WASHINGTON

Ferry County

POWER USERS AT REPUBLIC at a recent meeting to consider installation of Diesel oil engines at a central power plant, appointed committee of five to formulate plans for organization of a company and to get plans and prices from engine manufacturers

QUILP (Republic)—First car of ore is being shipped. Mine is under lease to Imperator-Quilp Co.

NORTH WASHINGTON POWER & REDUCTION CO. (Republic)—Plans are being made for resuming operations at cyanide plant; $10,000 having been subscribed by stockholders for this purpose.

Okanogan County

KELLER—Hoist and engine have been purchased and will be installed at once.

APACHE (Nespelem)—Fourth shipment of silver ore has been made; mine under lease to Hoyt & Beggs.

Stevens County

COPPER HOARD—Property has been inspected with view to further development work.

CHEWELAH CONSOLIDATED MINES CO. (Chewelah)—Organized to take over holdings of German Silver & Gold Co., operations will be started at once.

WISCONSIN

Platteville District

GREAT WESTERN (Galena)—A carload of hand-cobbed blende, shipped from old Pittsburgh property, four miles south of Galena, was taken out in sinking shaft through 30-ft. vein of ore.

WISCONSIN ZINC CO. (Benton)—Churn drilling has revealed 30 ft. of rich jack ground on Champion farm of 432 acres near New Diggings held under lease and option by company.

MINERAL POINT ZINC CO. (Highland)—Shipments have been resumed from Kennedy and Lewis properties which have been idle for nearly a year pending settlement and transfer of title and fee to Mineral Point company. Extensive improvements in machinery and equipment have been made which will greatly increase tonnage of both mines which formerly produced over 80% of carbonate ore output of Wisconsin.

CANADA

British Columbia

ENGINEER (Atlin)—Developments on this mine have been such that James Alexander, manager of the mine, has announced that a 100-stamp mill will be built. A two-stamp mill is working now, and in one week in October it produced 188 oz. of gold.

Ontario

SWASTIKA (Swastika)—Arrangements are being made for opening property.

TOUGH-OAKES (Kirkland Lake)—A rich strike of coarse gold in plates has been made on the 200-ft. level.

HOLLINGER RESERVE (Timmins)—Property under option to Lewisohns is being developed below 200-ft. level.

WEST BEAVER—This property in the Silver Mountain district has been taken over on a 12-months' working option by the Trethewey.

CROWN RESERVE (Cobalt)—Regular quarterly dividend of 2% has been declared, bringing total disbursement to date to 308%, or $5,437,537.

CONIAGAS (Cobalt)—An additional dividend bonus of 3%, making 14% in all, payable Nov. 1, has been declared, bringing the total returns to shareholders up to $5,920,000.

KERR LAKE (Cobalt)—Three of the veins found at bottom of lake after water had been partially pumped out, have been cut on 140-ft. level, and are now being developed. Where intercepted underground, they were mere cracks and did not show any high-grade ore.

NORTH DOME (South Porcupine)—Plaintiff, for loss of eyesight in an underground explosion, was awarded damages of $3250 and costs. Jury found negligence in fact that mine captain failed to inspect work after it had been reported that there were several missed holes in preceding round.

TIMISKAMING (Cobalt)—Announcement has been made of intention to discontinue payment of dividends and also work on North Dome property in Porcupine on account of insufficient funds. Development on lower levels while succeeding in opening several pockets of rich ore, has been disappointing.

PORCUPINE CROWN (South Porcupine)—Winze, which has been sunk 60 ft. below the 400-ft. level, shows average of $80 per ton over width of 5 ft.; general average of mine, however, is about $22 and general manager states that to date, ore to value of $1,700,000 has been developed above the 400-ft. level. Cleanup from 10-stamp mill in September returned $29,000. With addition to mill in operation, plant will treat 100 tons per day. A new shaft is being sunk 1000 ft. south of present main working, where ore has been proved to depth of 300 ft. by diamond drilling.

MEXICO

Sonora

MONTE CRISTO (Moctezuma)—A recent strike of high-grade ore has been encountered on the fifth level

GREENE-CANANEA (Cananea)—Operations continue at 60% capacity. From its own ores company is producing about 2,500,000 lb. of copper per month, while from custom ores secures 500,000 lb. additional. Aside from this yield plant, treating Miami concentrates, produces approximately 3,000,000 lb. or a total of 6,000,000 lb. per month.

NICARAGUA

ORGANIZING CURRENCY SYSTEM has been done. There is a central national bank representing the interests of American capital in establishing sound financial conditions. New standard is a coin exactly equivalent to U. S. dollar. Representatives of American bankers who will have charge of collection of Nicaragua custom dues and administration of financing of country through central bank are to have moral support of this Government. Washington dispatches intimate that Secretary of State is to be authorized to appoint one of two directors nominated by Nicaraguan minister of finance on board of national bank and be represented in administration of Nicaraguan railroad.

COLOMBIA

Antioquia

S. PEARSON & SONS, LTD. (London)—This company has made a contract with the Colombian government for the exploration of oil fields in Colombia, which contract is now before Congress in session at Bogota, and will no doubt be ratified. The contract gives the privilege of exploration, on certain conditions respecting subsequent exploitation, of zones not exceeding 10,000 km. in extent, for the period of two years. The contract, however, is said not to prohibit others from obtaining similar privileges, under similar conditions, respecting districts not included in those specified in this contract, and, therefore, is claimed to be not a monopoly in any sense of the word. At the same time it is true that there are other petitions before the government for similar privileges, and that these will also be obtained is also probable. The only monopoly in fact that does exist today in Colombia in the oil industry may be said to be that given to a company for refining oil on the Atlantic coast, which company was given a concession for 25 years with the sole privilege of refining oil within a zone of 50 km. width along the entire Atlantic coast. This company afterward obtained the privilege for the importation of crude oil free of duty and for the full capacity of their refinery, in case sufficient oil was not obtained from the exploitation of their own wells, and in fact this refinery imports most of its crude oil from the United States and besides enjoys the benefits of a high duty on refined oil from other countries. However, only four years remain for the termination of this concession.

SPAIN

STRIKE SITUATION at Huelva is serious. It is estimated that about $2,000,000 has been lost, and it is known that miners are suffering greatly. Rio Tinto company has received an offer of 4000 German strikebreakers, but the offer has not been accepted yet, as it is certain that such action would be followed by serious disorders.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Nov. 5

The metal markets have been inclined to quiet and have been rather weak as to prices. There has been some irregularity in the general movement.

Copper, Tin, Lead and Zinc

Copper—The market has been quiet and weak. It is evident that on account of the recession in business the supplies and purchases of consumers are going to carry them further than had been previously anticipated. This in a great measure explains the recent paucity of orders. Several of the agencies in their efforts to draw business have offered copper down from day to day without succeeding in placing more than a few million pounds. The outstanding feature of the last week has been the fact that one of the large agencies, which heretofore has held firmly for 16⅞c., has been soliciting bids at lower figures. However, we do not hear of any business having resulted as yet.

We have heard of some few carloads of Lake copper sold at 16¾c., while the large producer is supposed to be still naming 17¼c. Conditions in this market continue unchanged and quotations but nominal.

Casting copper offered liberally has failed to find buyers.

At the close we quote Lake copper, nominally, at 16¾@17¼c.; electrolytic in cakes, ingots and wirebars at 16.10@16.25c. Casting copper is quoted nominally at 15¾@16c. as an average for the week.

The London standard market has been very weak and considerable bear selling is reported. It is noteworthy that a large backwardation of over £1 as between cash and three months continues. On Thursday, Oct. 30, spot standard was £73 10s. and three months £72 7s. 6d. On Friday it was about 5s. lower, but on Monday it dropped £2, spot being £71 10s. and three months £70 7s. 6d. On Wednesday there was a slight reaction, spot closing at £71 12s. 6d. and three months £70 7s. 6d. per ton.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 3371 long tons. Our special correspondent gives the exports from Baltimore for the week at 2974 tons.

Visible stocks of Copper in Europe on Oct. 31 are reported as follows: Great Britain, 12,280; France, 2970; Rotterdam, 2400; Hamburg, 1080; Bremen, 1000; other European ports, 1050; total, 21,780 long tons, or 48,787,200 lb.; a decrease of 1400 tons from Oct. 15. In addition to the stocks above 1350 tons are reported afloat from Chile and 2750 from Australia, making a total of 26,880 tons.

Tin—Statistics for the American position which were published on Nov. 1 turned out better than anticipated, and the expectation of a resumption of buying by the tinplate mills gave the market a very strong tone at the end of last week. There was good buying by consumers, and quotations on Nov. 1 were marked about ¼c. per lb. over the London closing price of Oct. 31. The London market did not respond to the better tone in our market and became weak on Nov. 3. Since then, however, it has again strengthened materially and closes firm at £183 7d. 6s. for spot and £184 7s. 6d. for three months, and about 40¼c. for November tin here.

Shipments of tin from the Straits in October were 5020 long tons; an increase of 570 tons over October of last year.

Visible stocks of tin on Oct. 31 are reported as follows, including tin afloat: London, 6215; Holland, 850; United States, excluding Pacific ports, 4792; total 11,857 long tons, a decrease of 1086 tons during October.

Lead—The market is active, but orders are very eagerly competed for. Prices are unchanged at 4.17½@4.20c. St. Louis and 4.32½@4.35c., New York.

At London, Spanish lead is quoted £20 12s. 6d. and English lead 10s. higher.

Spelter—The market is quiet and without special feature. St. Louis is quoted 5.15@5.20c., and New York 5.30@5.25 cents.

The London market is slightly lower, good ordinaries being quoted £20 5s. and specials £21 5s. per ton.

The base price of sheet zinc in carload lots is now $7.50 per 100 lb. f.o.b. cars Peru, Ill., less 8% discount.

Mineral Exports of Spain seven months ended July 31, reported by "Revista Minera" in metric tons.

Exports	Metals 1912	Metals 1913	Ores 1912	Ores 1913
Iron	26,137	7,500	4,826,584	5,677,485
Copper	13,484	13,607	85,900	103,530
Copper precipitate	8,510	3,401	....	....
Lead	109,883	121,474	3,686	1,274
Zinc	1,368	519	68,931	73,817
Quicksilver	1,476	1,472	....	....
Manganese	....	....	19,936	11,760
Pyrites	....	....	1,709,598	1,679,183

Pyritic ores carrying 2.5% or over in copper are classed as copper ore; below that they are classed as pyrites. Exports of salt were 403,171 tons in 1912, and 358,792 tons this year.

DAILY PRICES OF METALS

NEW YORK

Oct.-Nov.	Sterling Exchange	Silver	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
			*16⅜	16.35		4.32½	4.17½	5.32½	5.17½
30	4.8515	59½	@17¼	@16.40	40	@4.35	@4.20	@5.37½	@5.22½
			*16⅜	16.25		4.32½	4.17½	5.30	5.15
31	4.8495	59¼	@17¼	@16.35	40	@4.35	@4.20	@5.35	@5.20
			*16⅜	16.25		4.32½	4.17½	5.30	5.15
1	4.8505	59⅛	@17¼	@16.35	40¼	@4.35	@4.20	@5.35	@5.20
			*16⅜	16.15		4.32½	4.17½	5.30	5.15
3	4.8485	59⅛	@17¼	@16.30	39⅞	@4.35	@4.20	@5.35	@5.20
							4.17½		5.15
4	.....	...	.....	.....	..	....	@4.20	.....	@5.20
			*16⅜	16.10		4.32½	4.17½	5.30	5.15
5	4.8510	59½	@17¼	@16.25	40¼	@4.35	@4.20	@5.35	@5.20

*Nominal.

The quotations herein given are our appra'sal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Oct.-Nov.	Silver	Copper: Spot £ per Ton	Copper: Spot Cts. per Lb.	Copper: 3 Mos.	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos.	Lead: £ per Ton	Lead: Cts. per Lb.	Zinc: £ per Ton Ton	Zinc: Cts. per Lb.
30	27⅛	73½	15.97	72⅜	79½	182½	183¾	20⅜	4.48	20⅜	4.48
31	27⅜	73⅜	15.94	72⅛	79	183	184	20⅜	4.48	20¼	4.40
1	27 15/16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	27 7/16	71½	15.53	70⅜	77½	181¼	183	20⅜	4.48	20¼	4.40
4	27 7/16	71⅝	15.56	70⅜	77½	183¼	184¼	20½	4.44	20½	4.44
5	27½	71⅝	15.56	70⅜	77½	183¾	184¾	20⅜	4.48	20¼	4.40

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

Exports and Imports of Metals, other than iron and steel, in the United States, eight months ended Aug. 31, are reported as follows:

Metals	Exports 1912	Exports 1913	Imports 1912	Imports 1913
Copper, long tons	246,760	285,783	119,190	120,090
Tin, long tons	372	936	35,485	32,693
Lead, short tons	46,276	37,580	61,857	47,356
Zinc, short tons	6,428	8,124	4,069	5,632
Zinc in ore, lb.	13,480,634	10,224,121	18,930,781	19,805,154
Nickel, lb.	17,708,024	20,556,411	26,573,202	30,874,863
Antimony, lb.	40,992	63,620	11,432,269	11,673,666
Aluminum, lb.	211,036	39,077	12,029,888	18,597,057
Quicksilver, lb.	16,479	37,686	.....	.....
Platinum, oz.	.....	1,191	68,187	78,711
Ores, etc.:				
Zinc Oxide, lb.	23,223,275	20,726,722	.....	.....
Zinc Dross, lb.	403,918	56,696	.....	.....
Zinc dust, lb.	27,398	154,451	789,035	2,805,290
Zinc Ores, tons.	15,279	11,555	27,517	19,401

Copper, lead, nickel and antimony include the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately prior to July 1, 1912. The exports include reëxports of foreign material.

Other Metals

Aluminum—The market remains dull and prices are unchanged. Current quotation is 19½c. per lb. for No. 1 ingots, New York. The foreign market is easy.

Antimony—A good jobbing demand continues and prices are steady. Cookson's is quoted at 7.60@7.70c. per lb.; Hallett's 7¼@7⅜c.; while 6½@6¾c. per lb. is paid for Chinese, Hungarion, and other outside brands.

Quicksilver—Business is improving and prices are a shade firmer. The New York quotation is $38.50@39 per flask of 75 lb. with 56@57c. per lb. for retail lots. San Francisco price is $38.50 per flask, with special terms for export business. The London price is £7 5s. per flask, with £7 quoted from second hands.

Bismuth—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

Cadmium—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

Nickel—Quotations for ordinary forms, shot, blocks, or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Selenium—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold is still going to Egypt. No more gold has been taken for New York, beyond the $2,500,000 reported last week.

Imports of gold at New York, week ended Nov. 1, were $1,028,479, from Mexico, Cuba, South America and Australia. There were no exports.

Iridium—There is no change in this metal. Dealers continue to ask $83@85 per oz., New York. The foreign market is reported easier.

Platinum—The market is steadier and prices a little firmer. We quote $44.50@45 per oz. for refined platinum. Hard metal is $49@52 per oz., according to quality. The foreign market is reported firmer.

Silver—The market having fallen to 27 7/16d. as the result of the unsettled condition of India owing to financial speculators, remains dull and steady at current prices, and it is not at all unlikely that orders of any large amount could only be executed at a somewhat higher price.

Shipments of silver from London to the East, Jan. 1 to Oct. 23, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£8,791,500	£8,156,500	D. £ 635,000
China	1,066,000	702,000	D. 364,000
Total	£9.857,500	£8,858,500	D. £ 999,000

Exports of silver from New York for the week were $796,451, to London and Paris. Imports were $344,102, from Central and South America.

Imports of silver into France, eight months ended Aug. 31, were valued at 247,743,000 fr.; exports were 242,765,000 fr.; net imports, 4,978,000 fr., against 2,984,000 fr. last year.

Zinc and Lead Ore Markets

JOPLIN, MO.—Nov. 1

The high price of zinc blende is $46, the base per ton of 60% zinc ranging from $39 to $43 for choice grades. With the $1 advance in best grades came a general strengthening in all grades. Large orders were filled and the shipment shows an increase. Calamine is still unaffected in the base range of $21@23 per ton of 40% zinc, but the shipment was largely increased the past two weeks, cleaning up an accumulation of 1500 tons at Granby. The total shipment of zinc is the largest for two months. The average of all grades of zinc is $37.54 per ton. Activity in the purchase of lead ore seems not to advance the price, still $52 per ton of 80% metal content. The average of all grades is $50.86 per ton.

SHIPMENTS WEEK ENDED NOV. 1

	Blende	Calamine	Lead	Value
Totals this week	11,709,490	1,354,320	2,116,400	$314,925
Totals 44 weeks.	480,718,890	35,941,360	79,497,320	$13,095,509

Blende value, the week, $244,755; 44 weeks, $11,416,286.
Calamine value, the week, $16,350; 44 weeks, $461,994.
Lead value, the week, $53,820; 44 weeks, $2,117,239.

HOBART

PLATTEVILLE, WIS.—Nov. 1

The base price paid this week for 60% zinc ore was $42@43 per ton.

The base price paid for 80% lead ore was $53 per ton.

SHIPMENTS WEEK ENDED NOV. 1

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,703,260	.....	490,200
Year to date	123,751,680	5,652,670	48,780,000

Shipped during week to separating plants, 2,312,350 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Nov. 5

Production of steel continues to decline. Practically all the steel mills are reducing their working forces. This week steel is being produced at not much above 75% of full capacity.

Prices are declining, but not rapidly. Evidently the mills feel that buying would not be tempted by drastic reductions at this time, but it is intimated that when buyers are ready to take hold attractive prices will be made.

Even the more optimistic in the trade do not seem to expect any definite improvement in the situation in less than from four to six months. While much has been said about the necessity of readjusting steel prices, the present view seems to be that the future of the steel market will depend chiefly upon the state of trade generally.

Pig iron is rather slow, with new orders generally of small quantities for early delivery. Prices are pretty well maintained, though concessions are reported here and there.

PITTSBURGH—Nov. 4

The season price for tin plate has been announced at $3.40 for 100-lb. cokes, against $3.60 a year ago. The new price will be the basis for the large contracts made by can makers and other consumers for 1914 delivery, and will also govern jobbers' contracts for the first quarter. Last season's price was named on Sept. 4, 1912, by a large independent interest and immediately adopted by other sellers. At the time the general opinion was that the new price was announced too soon, but the present announcement is correspondingly late, buyers having shown little interest. The reduction of approximately $4 a ton in tinplate as compared with a year ago is due to the lower prices ruling for the chief raw materials, sheet bars and pig tin. Terneplates were reduced less than tinplate, the new price being $6.90 per double box, 214-lb., for 8-lb. coated ternes.

Pig Iron—Foundry iron has been altogether stagnant. Basic iron has sold at sharp cuts from the old quotation of $14, Valley. A 1500-ton lot of bessemer sold at $15.50, Valley, but two lots of 500 and 400 tons went at slight cuts. We now quote, as representing the outside of the market: Bessemer, $15.50; basic, $13,50; malleable, $14; No. 2 foundry, $13.75; forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

W. P. Snyder & Co. announce the October pig-iron averages, computed from the actual sales made in the trade, at $15.703, Valley, for bessemer, a decrease of 4.7c. from September, and $13.709 Valley, for basic, a decrease of 42.85 cents.

Ferromanganese—The market is dull but with prices well maintained at $50 for English and $49.50 for German, at Baltimore.

Steel—The billet and sheet-bar market continues to be made in irregular fashion, chiefly by mills offering concessions to their contract customers to prevent the business going elsewhere. We quote prices 50c. lower than a week ago, at $20.50 for billets and $21.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown. Rods are quotable weak at $26, Pittsburgh.

Pig Iron Production in Germany in September was 1,589,197 metric tons, or 49,627 tons less than in August. For the nine months ended Sept. 30 the total make was, in metric tons:

	1912	1913	Changes
Foundry iron	2,449,780	2,740,263	I. 290,483
Forge iron	401,250	377,351	D. 23,899
Steel pig	1,594,686	1,924,335	I. 329,649
Bessemer pig	286,715	270,076	D. 16,639
Thomas (basic) pig	8,383,371	9,131,380	I. 748,009
Total	13,115,802	14,443,405	I.1,327,603

The total increase was 10.1%. Steel pig includes speigeleisen, ferromanganese and all similar alloys.

IRON ORE

Lake Superior shipments in October were close to 7,000,000 tons; the full figures have not yet been received. There is no rush, as shipments are slowing down toward the end of the season. Shippers generally, expect to close up everything in November. Some of the larger companies intend to make the last shipments about Nov. 20 at latest.

A dispatch from Duluth, Nov. 4, reports total shipments for the season to Nov. 1 at 37,942,412 tons.

COKE

The Connellsville coke market is pretty well demoralized by the sharp break reported last week. The effort to maintain prices for furnace coke has been entirely given up, and some competition for orders is reported. Prices are rather uncertain, both for spot and contract coke.

Fuel Exports of Great Britain nine months ended Sept. 30, long tons:

	1912	1913	Changes
Coal	45,750,423	54,517,788	I. 8,767,365
Coke	680,713	838,055	I. 157,342
Briquettes	1,115,631	1,542,365	I. 426,734
Steamer Coal	13,202,091	15,545,617	I. 2,343,526
Total	60,748,858	72,443,825	I.11,694,967

Exports in 1912 were reduced by the general strike of miners. Imports were only 183,197 tons in 1912, and 16,180 tons this year.

Coal Production of German Empire eight months ended Aug. 31, in metric tons:

	1912	1913	Changes
Coal	116,395,324	127,318,665	I 10,923,341
Brown coal	52,880,655	56,658,980	I 3,778,325
Total mined	169,275,979	183,977,645	I 14,701,666
Coke made	18,688,125	21,418,997	I 2,730,872
Briquettes made	15,834,316	17,995,383	I 2,161,067

Of the briquettes reported this year 14,084,566 tons were made from brown coal or lignite.

Coal Production in France for the half-year ended June 30, is reported as below, in metric tons:

	1912	1913	Changes
Coal	19,825,768	20,208,779	I. 383,011
Lignite	368,626	402,813	I. 34,187
Total	20,194,394	20,611,592	I. 417,198

Of the total coal mined this year 13,848,970 tons came from the districts of the Nord and Pas-de-Calais.

CHEMICALS

NEW YORK—Nov. 5

The general market is a little steadier, but business is not especially active.

Arsenic—The market remains dull and not much improvement is expected this month. Prices are nominally unchanged, about $3 per 100 lb. being asked.

Copper Sulphate—The market is steady though not very active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is still dull and unsettled. Prices are unchanged at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

PETROLEUM

The monthly report of the "Oil City Derrick" gives the number of new wells completed in the United States—excepting California—in October as follows: Pennsylvania grade, 711; Lima-Indiana, 140; Kentucky, 13; Illinois, 184; Kansas-Oklahoma, 1057; Texas-Louisiana, 154. A grand total of 2339 wells was completed, with an initial production of 64,236 bbl. There were 380 dry holes and 176 gas wells. Compared with the September report there was an increase of 146 in wells completed, and 9906 bbl. in new production. New work at the close of the month comprised 685 rigs and 2292 drilling wells.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	June	July	August	September	October
Alaska shipments	2,203,191	2,705,136	1,847,785	2,261,216	.....
Anaconda	21,500,000	22,100,000	22,500,000	22,600,000	18,400,000
Arizona, Ltd.	2,600,000	2,600,000	1,800,000	1,800,000	.....
Copper Queen	7,477,936	8,369,607	8,252,404	8,434,803	8,292,929
Calumet & Ariz.	4,000,000	3,800,000	4,500,000	4,000,000	.....
Chino	3,682,706	4,831,185	6,050,867	4,308,296	.....
Detroit	1,750,601	1,549,224	2,187,223	2,102,818	1,861,878
East Butte	1,055,646	1,060,257	1,162,007	1,233,018	.....
Giroux	598,240	584,546	524,953	198,178	.....
Mason Valley	1,097,014	908,892	867,060	.....	.....
Miami	2,612,000	.....	.....	.....	.....
Mammoth	1,750,000	1,800,000	1,750,000	1,750,000	1,700,000
Nevada Con.	6,344,863	5,403,919	5,989,973	4,441,671	.....
Ohio	537,400	601,700	689,000	685,900	.....
Old Dominion	2,511,000	2,526,000	2,524,000	2,679,000	.....
Ray	4,392,612	4,097,000	4,269,519	4,336,434	.....
Shannon	924,000	880,000	1,248,000	1,232,000	.....
South Utah	185,000	140,000	223,498	241,843	.....
Tennessee	1,379,115	1,379,220	1,247,804	1,309,950	.....
United Verde*	2,900,000	3,000,000	3,000,000	3,000,000	.....
Utah Copper Co.	11,637,949	9,849,043	10,302,251	11,463,905	.....
Lake Superior*	16,500,000	17,500,000	9,700,000	6,950,008	.....
Non-rep. mines*	6,000,000	6,200,000	6,200,000	6,000,000	.....
Total prod.	104,051,138	101,758,167	96,769,607	.....	.....
Total blister	122,306,405	130,788,157	119,244,077	.....	.....
Imp. ore & matte	7,497,002	8,527,046	9,171,351	.....	.....
Total Amer.	129,803,407	139,315,203	128,415,428	.....	.....
Miami†	.....	2,890,000	3,097,500	2,688,000	2,862,050
Shattuck-Arizona	1,059,625	1,019,388	1,001,634	1,163,237	.....
Brit. Col. Cos.:					
British Col. Cop.	634,238	618,379	647,905	621,120	.....
Granby	1,789,000	1,664,102	1,847,344	1,824,659	.....
Mexican Cos.:					
Boleo†	1,984,640	2,240,720	2,264,640	2,369,920	.....
Cananea	2,908,000	3,328,000	3,186,000	3,148,000	.....
Moctezuma	3,438,793	2,693,006	3,542,047	3,024,121	3,178,136
Other Foreign:					
Braden, Chile	1,804,000	1,046,000	1,572,000	1,332,000	.....
Cape Cop., S. Af.	414,400	.....	.....	.....	.....
Kyshtim, Russia	1,000,000	2,500,000	1,585,000	.....	.....
Spassky, Russia	835,520	660,800	1,048,320	1,025,920	.....
Exports from Chile	5,824,000	9,856,000	8,736,000	5,600,000	.....
Australia	7,616,000	10,304,000	7,720,000	6,944,000	.....
Arrivals–Europe‡	5,277,440	11,728,640	14,624,960	9,661,120	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	United States: U.S.Refin'y Production	United States: Deliveries, Domestic	United States: Deliveries, for Export	Visible Stocks: United States	Visible Stocks: Europe	Visible Stocks: Total
X, '12.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII.	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX.	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X.	.....	.....	.....	29,793,094	53,625,600	83,418,694
XI.	.....	.....	.....	.....	48,787,200	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Alameda, Ida.	Oct. 21	Nov. 20	0.0015
Bismarck, S. D.	.....	.....	0.01
Carbonate, Ida.	Nov. 3	Nov. 22	0.001
Carlin-Nevada, Nev.	Oct. 25	Nov. 11	0.001
Cedar Extension, Utah.	Oct. 30	Nov. 17	0.005
Central Eureka, Calif.	Oct. 13	Nov. 14	0.05
Comet, Ida.	Oct. 20	Nov. 20	0.0005
Copper King, Ida(postpon'd)	Sept. 14	Nov. 14	0.01
Corbin, Mont.	.....	Nov. 14	1.00
Crown Point, Nev.	Oct. 20	Nov. 12	0.10
Dennemora, Ida.	Oct. 20	Nov. 20	0.0025
Eureka, Utah.	Oct. 21	Nov. 11	0.001
Globe Cons., Utah.	Nov. 6	Nov. 28	0.001
Gold Bond, Utah.	Nov. 10	Nov. 24	0.001
Hamburg-American.	July 22	Nov. 9	0.0075
Lead-Bullion, Utah.	Nov. 5	Nov. 26	0.004
Lewis & Clark, Ida.	Oct. 15	Nov. 18	0.0075
Mountain Queen, Ida.	Oct. 17	Nov. 17	0.0005
North Star, Ida.	Oct. 23	Nov. 24	0.0005
Payson-Eldorado, Utah.	Oct. 31	Nov. 21	0.0005
Revenue Cons., Utah.	Oct. 29	Nov. 19	0.005
Spider, Utah.	Oct. 23	Nov. 15	0.0025
Sunset, Ida.	Oct. 18	Nov. 12	0.002
Sunset, Nev. (postpon'd)	.....	Nov. 17	.....
Tonopah, Gypsy Queen.	Oct. 20	Nov. 24	0.01
Utah United, Utah.	Oct. 1	Oct. 30	0.01
Wisconsin, Ida.	Oct. 9	Nov. 10	0.002

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	60.793	24.594	29.299	28.083
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	16.337	17.661	16.913	76.389	73.383
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.410	223.762	193.074
October	50.077	40.462	228.353	184.837
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	4.402	4.894	4.253	20.630	20.302
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	5.340	7.276	5.188	27.543	20.614
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.65	16.03	15.04	15.63	14.93
October	17.90	16.60	17.18	14.61	17.22	14.80
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Nov. 4

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01½
C. K. & N.	.08½
Doctor Jack Pot.	.06
Elkton Con.	.54½
El Paso	2.80
Findlay	.02
Gold Dollar	.09
Gold Sovereign	.02½
Isabella	.09½
Jack Pot	.05
Jennie Sample	.04
Jerry Johnson	.03½
Lexington	‡.005
Moon Anchor	‡.006
Old Gold	.01½
Mary McKinney	.55½
Pharmacist	.01
Portland	.95
Vindicator	.82

SALT LAKE Nov. 3

Name of Comp.	Bid.
Beck Tunnel	.04
Black Jack	.07
Cedar Talisman	.00½
Colorado Mining	.10½
Columbus Con.	‡.01
Crown Point	.00½
Daly-Judge	5.50
Grand Central	.52
Iron Blossom	1.10
Little Bell	‡.10
Lower Mammoth	.01
Mason Valley	4.00
May Day	.04
Nevada Hills	.50
New York	‡.02½
Prince Con.	.25
Silver King Coal'n	3.82½
Sioux Con.	.01
Uncle Sam	.03½
Yankee	‡.08½

TORONTO Nov. 4

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.07½	Foley O'Brien	.15
Coniagas	7.00	Hollinger	17.12½
T. & Hudson Bay	‡70.00	Imperial	‡.02
Timiskaming	.11	Jupiter	.08
Wettlaufer-Lor.	.08	Pearl Lake	.12
Apex	‡.01	Porcu. Gold	.12
Big Dome	10.00	Preston E. D.	.03
Crown Chartered	‡.00½	Rea	.16
Dobie	.10	Swastika	.03
Dome Exten.	.08	West Dome	.05

SAN FRANCISCO Nov. 4

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.06	Belmont	7.25
Belcher	.23	Jim Butler	.64
Best & Belcher	.06	MacNamara	.10
Caledonia	1.75	Midway	.39
Challenge Con.	.08	Mont.-Tonopah	1.05
Chollar	.06	North Star	.42
Confidence	.38	West End Con.	1.20
Con. Virginia	.18	Atlanta	.12
Crown Point	.28	Booth	.02
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.11	Comb. Frac.	.03
Mexican	1.45	Jumbo Extension	.08
Occidental	.70	Pitts.-Silver Peak	.40
Ophir	.28	Round Mountain	.38
Overman	.41	Sandstorm Kendall	.08
Potosi	.04	Silver Pick	.03
Savage	.14	Argonaut	3.00
Sierra Nevada	.13	Bunker Hill	‡1.50
Union Con.	.23	Central Eureka	.16
Yellow Jacket	.30	So. Eureka	2.00

N. Y. EXCH. Nov. 3

Name of Comp.	Clg.
Amalgamated	71½
Am. Agri. Chem.	43
Am.Sm.&Ref.,com.	62½
Am. Sm. & Ref., pf.	99½
Am. Sm. Sec., pf. B	89½
Anaconda	34½
Batopilas Min.	1
Bethlehem Steel,pf.	70
Chino	38½
Federal M. & S., pf.	38
GreatNor.,ore,,ctf.	31½
Guggen. Exp.	44½
Homestake	107
Inspiration Con.	14½
Miami Copper	22½
Nat'l Lead, com.	43½
National Lead, pf.	101½
Nev. Consol.	15½
Phelps Dodge	188
Pittsburg Coal, pf.	89½
Quicksilver, pf.	4½
Ray Con.	18½
Republic I&S,com.	19
Republic I&S, pf.	79
SlossSheffl'd,com.	26
Sloss Sheffield, pf.	86
Tennessee Copper	28½
Utah Copper	51
U. S. Steel, com.	56
U. S. Steel, pf.	105½
Va.Car.Chem.,pf.	93

N. Y. CURB Nov. 3

Name of Comp.	Clg.
Ariz. Belmont	.11
Barnes King	1½
Beaver Con.	.32
Big Four	.19
Braden Copper	6½
B. C. Copper	2½
Buffalo Mines	2
Can. G. & S.	.19
Caribou	.60
Con. Ariz. Sm.	.25
Coppermines Cons.	3
Davis-Daly	1½
Diam'field-Daisy	.04
Ely Con.	.06
Florence	.23
Gold Hill Con.	.25
Goldfield Con.	1 7/16
Greene Cananea	32
Greenwater	.05
Internat. S. & R.	‡115
Kerr Lake	4½
La Rose	1½
McKinley-Dar-Sa.	1½
Min. Co. of A. new	2½
New Utah Bingham	.79
Nipissing Mines	8
Ohio Copper	.50
Pacific Sm. & M.	‡½
Puebla S. & R.	3
South Utah M&S	3/16
Stand'd Oil of N.J.	377
Stewart	1½
Tonopah	4½
Tonopah Ex.	1½
Tonopah Merger	.59
Tri-Bullion	½
Tularosa	1½
Union Mines	.08
United Cop., pfd.	‡3
Yukon Gold	2½

LONDON Oct. 25

Name of Comp.	Clg.
Camp Bird	£0 14s 9d
El Oro	0 14 6
Esperanza	0 17 6
Mexico Mines	5 7 6
Oroville	0 8 0
Santa Gert'dis.	0 14 6
Stratton's	0 1 0
Tomboy	1 6 3

BOSTON EXCH Nov. 3

Name of Comp.	Clg.
Adventure	1¼
Ahmeek	275
Alaska Gold M.	21½
Algomah	1½
Allouez	34½
Am. Zinc	17½
Ariz. Com., ctfs.	41½
Bonanza	.35
Boston & Corbin	.50
Butte & Balak	4¼
Calumet & Ariz.	63½
Calumet & Hecla	410
Centennial	13½
Cliff	1
Copper Range	37½
Daly West	2
East Butte	11½
Franklin	3
Granby	60½
Hancock	15½
Hedley Gold	30
Helvetia	.25
Indiana	3½
Island Cr'k, com	46½
Island Cr'k, pfd.	82
Isle Royale	18
Keweenaw	1½
Lake	8
La Salle	3½
Mass.	2
Michigan	1
Mohawk	41
New Arcadian	1½
New Idria Quick.	2½
North Butte	23½
North Lake	1½
Ojibway	.50
Old Dominion	48½
Osceola	78
Quincy	58
Shannon	6½
Shattuck-Ariz.	26½
Superior	23
Superior & Bost.	2½
Tamarack	28
Trinity	4½
Tuolumne	.85
U. S. Smelting	37
U. S. Smelt'g, pf.	46½
Utah Apex	1½
Utah Con.	8½
Victoria	1½
Winona	1½
Wolverine	42
Wyandot	.50

BOSTON CURB Nov. 3

Name of Comp.	Bid
Bingham Mines	5½
Boston Ely	.47
Butte&Lon'nDev.	.28
Cactus	.02
Calaveras	1½
Chief Cons.	1 1/16
Corbin	.30
Cortez	.20
Crown Reserve	1½
Eagle & Blue Bell	1
First Nat. Cop.	2½
Houghton Copper	3½
Majestic	.27
Mexican Metals	.41
Moneta Porc.	‡.07
Nevada-Douglas	1½
New Baltic	.50
Oneco	.80
Raven Copper	.08½
Rhode Island Coal	‡.01
Smokey Dev.	.75
So. Lake	3½
S. W. Miami	‡1½
Tonopah Victor	.28
Trethewey	.25
United Verde Ext.	.45

‡Last Quotation.